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ANNALS

OF

SURGERY

A MONTHLY REVIEW OF SURGICAL SCIENCE AND PRACTICE.

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ANNALS OF SURGERY.

THE DIAGNOSIS AND TREATMENT OF SURGICAL AFFECTIONS OF THE KIDNEYS, WITH ILLUSTRATIVE CASES.[1]

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IT is related of Sir William Lawrence, who succeeded Abernethy as lecturer on surgery at St. Bartholomew's Hospital, that he was in the habit of saying in one of his lectures, "The kidney, gentlemen, is fortunately beyond the reach of the surgeon." As late as 1882, in speaking of renal abscess, Gross[2] says, "The treatment of this affection must at first be strictly antiphlogistic, and afterwards supporting." The same conservatism is observed in speaking of renal calculi. He says,[3] "The treatment in retained calculus is, in general, altogether palliative, consisting of the abstraction of blood by cups and leeches, the warm bath, and the administration of anodynes. In some cases relief can be secured only by nephrectomy or excision of the affected organ."

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[1] Read before the Surgical Section of the College of Physicians of Philadelphia, October 9, 1896.

[2] A System of Surgery, 6th Ed., Vol. II, p. 659.

[3] Ibid., p. 660.

Perhaps no better illustration could be given of the rapid advances of surgery in recent years than a comparison between the practice when Gross wrote the above and that of the present time, a period of but fourteen years. To-day the kidney is opened for abscesses, calculus, and hydro- or pyonephrosis, or is extirpated if the conditions present demand it, with a very fair proportion of successes. It is not considered a dangerous procedure to cut down and explore the organ, and this is frequently resorted to, though not as often as it should be, we believe, when persistent renal symptoms continue after the employment of appropriate medical measures.

Despite the number of operations upon the kidney recorded within the past fifteen years, there is still manifest an undue conservatism in dealing with renal surgical conditions. Many of the patients who succumb to their disease, or after operation recover with permanent urinary fistulæ, could reasonably be expected to have avoided both possibilities by an earlier resort to operative interference. Chronic painful affections of the kidney belong properly to the surgeon. Abscess, calculus, hydro- or pyonephrosis, and floating kidney are not amenable to any form of medical treatment. Even nephralgia is most successfully relieved by surgical measures in many cases.

An obstacle to the more rapid advancement of renal surgery is the difficulty in arriving at a positive diagnosis. Many illustrations are recorded in literature in support of this statement. Franks refers to a woman who is said to have had both ovaries removed before her troubles were finally dissipated by the extraction of a stone from her kidney.[1] A further difficulty lies in the uncertainty of detecting a calculus even when present. In a recent contribution on this subject Ransohoff has collected forty-four cases, in all of which symptoms of renal calculus existed, the kidney was explored and no stone found.[2] Two of the patients died, and at the autopsy the kidney that had been explored was found to contain a calculus in both instances. Shepherd[1] reports a case upon whom he operated for stone in the kidney, but failed to find any evidence of a calculus. Although the symptoms were temporarily mitigated, they recurred and were even more severe than before. Six months after the first operation he again cut down on the kidney, and by introducing a finger through an incision in the convexity, a stone was found in the upper part of the pelvis, and was removed with entire relief from the former symptoms. The same difficulty may attend the detection of a small circumscribed abscess.

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[1] ANNALS OF SURGERY, Vol. x, 1887, p. 7.

[2] Journal of the American Medical Association, Vol. xxv, No. 1, 1895, p. 4.

The occurrence of abscess in connection with spinal caries sometimes gives rise to renal symptoms. G. A. Wright records a case[2] "without any deformity or tenderness of the spine; there was unilateral rigidity, testicular pain, intermission of symptoms, increased frequency of micturition, nausea during the attacks, and oxaluria with local pain and tenderness. Subsequently an abscess developed, and on exploration a small patch of caries was found." In writing on this subject, Mr. Jacobson[3] calls attention to the great difficulty which may arise in distinguishing between certain cases of spinal caries and renal calculus. Erichsen[4] describes a case in which an abscess dependent upon caries of the vertebræ not only assumed the perinephritic form, but opened into the pelvis of the kidney, thus simulating chronic pyelitis. The diagnosis was made by observing molecular fragments of carious bone in the pus.

A subphrenic abscess or an appendicular abscess may, in some cases, become perirenal by extension, and the condition then simulates a renal affection. Hydro- and pyonephrosis and tumors of the kidney may be confounded with such diffuse suppuration. The distinct mass, as distinguished from a diffuse swelling, which can usually be felt in the region of one of the kidneys, together with the other symptoms and the history,

[1] ANNALS OF SURGERY, Vol. X, 1889, p. 339.

[2] Medical Chronicle, No. 6, p. 642.

[3] British Medical Journal, 1890, Vol. I.

[4] Science and Art of Surgery, 8th Edition, Vol. II.

will usually lead the examiner to locate the disease, at least, if not to the determination of its exact nature.

The diagnosis of the common renal affections is to be made upon a careful study of the history, attention to all the symptoms, and frequently-repeated examinations of the urine.

Stone in the kidney, if smooth and embedded in the parenchyma, may give rise to no inconvenience whatever. The autopsy has, in a number of instances, given the first intimation of the existence of a renal calculus. Usually, however, the patient will have some of the following symptoms: lumbar pain, fixed or radiating towards the genitalia or the upper portion of the thigh of the affected side, irritability of the bladder, gravel, hæmaturia, acid pyuria, and renal colic. Any of these may be constant, paroxysmal, or induced by active exercise. According to Franks,[1] the only symptoms that have been present in all cases are pain radiating from the region of the kidney and tenderness on pressure over the affected organ. Ransohoff[2] lays particular stress on the presence of red blood-corpuscles at every examination of the urine. He records three cases of nephrolithiasis in which the urine was repeatedly examined over periods of from one to six months, and in every instance microscopic hæmaturia existed. Acid pyuria was also constant in all three cases.

Palpation is at best of but occasional value. In the forty-four cases collected by Ransohoff, in which the symptoms of calculus were present, palpation and puncture by the exploring needle after having exposed the kidney failed to detect a stone; hence the improbability of appreciating the average kidney stone through the abdominal wall. Morris has called attention to the uncertainty of detecting calculi by direct palpation of the kidney, and relates a case in which the most careful examination by touch after a kidney had been removed from the body failed to reveal a renal calculus that was found to be present after laying the organ open.[3] He therefore recommends, in case no concretion is detected by thorough palpation of the surface of the organ and its pelvis, that a longitudinal incision be made on the convex border of the kidney in order to permit the finger to be introduced into the pelvis, when each portion of the gland may be examined successively. In this way, it is thought, the smallest calculus will be discovered. At the present time the use of the Röntgen ray might prove an invaluable aid in diagnosis. With greater perfection of the elements employed in its production and with larger experience it does not seem improbable that in the near future we may be absolutely certain as to the presence of renal calculi, in which event the necessity for exploratory operation would no longer exist. Contrary to the advice of some writers we believe an operation is indicated as soon as a renal calculus is diagnosed; the danger of a later pyelitis and pyelonephritis is thus removed. It cannot be doubted that most kidney stones cause more or less irritation, which in time would lead to permanent and progressive organic change in the organ.

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[1] ANNALS OF SURGERY, Vol. v, 1887, p. 7.

[2] Op. cit.

[3] Diseases of the Kidney, p. 527.

The symptoms of circumscribed abscess of the kidney may be as indefinite as those of calculus, but are well illustrated by five of Morris's cases, operated upon for stone, in all of which the symptoms were found to have depended upon abscess. All of these patients had complained of localized pain, and pus and blood had been present in the urine in each. Three had tenderness on pressure over the kidney, four had had retching or vomiting, in two instances the abdominal muscles were rigid and there was some dulness and fulness of the affected side. In Case III, operated upon by Dr. White for Dr. Tyson, a marked feature was the persistent flexion of the thigh on the same side as the affected kidney. Blood is not always present in the urine, as is shown by two of the cases here reported. Pus is almost invariably, perhaps always, observed early in the disease.

Some degree of fever is apt to accompany abscess of the kidney. This is especially true of the acute form; but in those of slow formation there may be little or no rise of temperature. To illustrate some of the difficulties that are occasionally met with in arriving at a diagnosis of these cases, Ralfe[1] reports a case in which many of the signs of renal disease were caused by a duodenal ulcer, and another in which intestinal irritation gave rise to the same symptoms. Malignant tumors of the cæcum have been mistaken for disease of the kidney. Morris[1] reports a case presenting the symptoms of renal abscess in which it was disclosed at the operation that the condition depended upon an abscess in the cellular tissue below and behind the kidney secondary to malignant disease of the sigmoid flexure, and again[2] two cases of malignant disease of the colon that simulated movable kidney.

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[1] British Medical Journal, 1888, Vol. 1, 183.

Case XVII, operated upon by Dr. White for Dr. Pepper, had all the rational evidences of abscess of the kidney:—Constant pain in the left loin, a fulness on palpating the corresponding kidney, fever, constitutional depression and pyuria, but exploratory operation revealed a cylindrical epithelioma (colloid carcinoma) of the descending colon. These cases might be multiplied, but they are sufficient to indicate the possibilities that must be borne in mind.

The symptoms of hydro- and pyonephrosis most commonly observed are a constant, dull pain in the loin corresponding with the affected kidney; this may last over a long period. Sooner or later a fulness or a distinct tumor can usually be felt. In pyonephrosis the urine commonly contains pus which varies in amount; pyuria is probably always present if the secretion from the affected kidney constantly passes into the bladder. In some instances, however, the discharge is periodical on account of obstruction in the ureter from a calculus, a kink due to displacement of the kidney, or other cause. Repeated examinations will, however, render an error in this respect improbable. The presence of pus in the urine may be due to cystitis, prostatitis, urethritis, etc. Its source may be determined in most cases by the history and symptoms, and by remembering that in the case of suppuration in the kidney the urine is usually acid, while in long-standing cystitis it is alkaline. Microscopic examination may disclose the seat of disease by the presence of elements characteristic of a particular locality. Blood is also present in many cases. If the condition is secondary to calculus, crystals may be detected by microscopic examination of the sediment, although their presence does not necessarily indicate a renal concretion. Rigors are not infrequent and an irregular temperature is common.

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[1] British Medical Journal, 1892, Vol. 1, 899.

[2] Lancet, London, April 27, 1895.

In many cases the quantity of urine passed on successive days varies very greatly. This results from occlusion of the ureter of the affected kidney by torsion, by calculus, or other factor which causes the urine to be retained within the renal pelvis. During this period the urine that is passed comes entirely from the opposite kidney, so that if this be healthy, the secretion will present no abnormal appearances. If now the tumor be examined it will be found to have enlarged, and the distress will be increased. Suddenly when the pressure becomes sufficient to overcome the torsion or other cause of obstruction the kidney empties itself with partial or total relief of pain and with diminution in the size of the tumor, and there will be a simultaneous increase in the quantity of urine passed. If this be examined it may be found to contain pus, degenerated epithelium, amorphous matter, and perhaps some blood and crystals.

The introduction of the cystoscope and of catheterization of the ureter, which in women is a comparatively simple procedure, and in men may be accomplished after some dexterity is acquired in the use of the necessary instruments, has added greatly to our diagnostic resources. Ureteral catheterization as an aid in determining the condition of the supposed healthy kidney in cases in which a nephrectomy is contemplated is especially valuable. In most cases in which a less radical attack is to be made the indications are not influenced particularly by the condition of the other organ, excepting so far as the risk of anæsthesia is concerned.

Finally, if doubt exists, exploratory operation should be performed. This, of itself, is nearly or quite free from danger. Mr. Henry Morris, who has had a large experience in renal surgery says, "I am convinced that exploration, far from being made too often, is not resorted to often enough; that many patients are allowed to go on too long, often to a fatal length, suffering from conditions from which they would at once be freed by an operation."

While it is true that in these cases operation, even for exploratory purposes, should not be the first resource, on the other hand, it should not be delayed until there are advanced destructive changes in the kidney, perirenal suppuration, and systemic intoxication. In such cases, an ideal operation is rarely possible on account of the local and general conditions of the patient, and the most that can be done, probably, is to drain abscesses. If the patient survives, a permanent renal fistula will probably remain.

There is another class of cases in which the symptoms point strongly to nephrolithiasis, and, although the kidney is thoroughly explored and no stone is found, the exploratory incision is followed by entire relief. The fact that all symptoms disappear in these cases naturally leads to the conclusion that the usual gross organic changes which we are accustomed to find associated with such symptoms have not been present; the condition probably has been nephralgia.

Case XV here reported is a typical example of this class. Although he had suffered so much that he had been obliged to give up his work for two years on account of pain, a simple incision into the kidney and exploration with the finger, without detecting any abnormal condition whatever, resulted in curing the "nephralgia" that had resisted all medical treatment.

Tiffany in 1885 recommended division of the capsule of the kidney for nephritic colic on the supposition that irritation from one cause or another might cause swelling of the organ, which being resisted by the dense capsule would give rise to pain. In 1888 a suitable case presented, and after the usual exploration, without finding any abnormal condition excepting a deep stellate scar on the anterior and outer aspect of the kidney (which was supposed to be the site of a healed gumma as the patient had had syphilis), he divided the capsule of the kidney for a distance of three inches or more. The cut edges gaped widely, which he considered evidence that tension existed. The operation was followed by relief of the pain which had existed for three years. Tiffany has collected a number of cases which support his theory. This subject seems related to the question of "The Supposed Curative Effect of Operations, *per se*,"[1] in regard to which one of the writers contributed some observations and collected a large number of illustrative examples.

The cases here reported include three out of many operated on for movable kidney. This condition is probably of more frequent occurrence than is usually supposed. In the milder forms the discomfort is so slight that either no advice is sought or the symptoms are ascribed to slight functional derangement and no special examination of the kidney is made. Morris[2] makes a distinction between "floating" and "movable" kidney. The former he considers to be of congenital origin and the latter an acquired condition. Kuttner[3] recognizes four forms: (*a*) those in which the organ shows respiratory mobility without important displacement; (*b*) cases in which the organ can be distinctly felt, the displacement being anterior, is mobile with respiration, and can be pushed out of place by the hands; (*c*) the decidedly floating kidney; (*d*) where the kidney is dislocated but fixed.

Tuffier[4] offers the following clinical classification for movable kidney: (1) painful, (2) dyspeptic, (3) neurasthenic. The first of these forms is that most frequently met with and gives rise to pains of varying character and intensity. The pains are capable of variable explanations but are directly referable to the region of the kidney. The second form, the dyspeptic, does not suggest the nature of the trouble so directly, but presents a more obscure complexus of symptoms, which are to be referred rather to the gastro-intestinal tract. They vary from slight dyspeptic manifestations to intense nausea, intestinal pain and vomiting. Finally, some cases present a peculiar and overwhelming predominance of nervous symptoms and are to be classified as a separate group. The nervous phenomena are apt to be those of hypochondriasis or of hysteria, and in some instances at least have been entirely relieved by removing the mobile condition of the kidney.

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[1] ANNALS OF SURGERY, August and September, 1891.

[2] New York Medical Journal, April 4, 1891.

[3] Edinburgh Medical Journal, August, 1890.

[4] La Semaine Médicale, September 16, 1891.

The cause of movable kidney has not been determined, but it is probable that different factors are responsible in different cases. Among the causes mentioned are the loss of the fatty capsule which is replaced by a loose net-work of tissue, pregnancy, pendulous abdomens, a condition of enteroptosis, heredity, the presence of a mesonephron, either congenital or acquired, etc.

Kendall Franks[1] has studied this subject carefully, and concludes from the examination of kidneys hardened in the body by injecting Müller's fluid that these organs are retained in their normal position by the pressure of the neighboring viscera. The kidneys showed well-marked depressions caused by the liver, the bowel, and other organs. Gastric crises, accompanying movable kidney, this writer thinks, could be explained easily by the mechanical effects of traction on the duodenum or colon.

The prognosis after operation for the conditions under consideration depends upon the stage of the disease and in any particular operation upon the integrity of the opposite kidney. It has long been recognized that the mortality following nephrotomy is much less than that after nephrectomy. If, therefore, the disease be attacked, at a time when the former operation is still appropriate, the patient's chances are very much better than if operation is delayed until the renal tissue has been entirely replaced by a suppurating cavity, and when entire removal of the kidney is demanded. If the opposite kidney is also diseased, the condition becomes a most serious one, and any operation should be undertaken after mature consideration only. Sometimes the conditions are such that there is no choice in the matter, as in anuria from calculus. This interesting complication has been investigated by Legueu,[2] who found that of 56 cases treated conservatively, 16 recovered in from three to twenty days, 40 or 71.5 per cent. died in from four to twenty-five days. In 23 of 30 autopsies performed on these patients, the ureter was found blocked by a stone, while in 7 there was no gross mechanical obstruction; in 3 cases there was but one kidney; in 6 both ureters were obstructed by calculi; in 14 additional cases both kidneys contained stones; in 6 there were other evidences of disease, chiefly suppuration; in 1 case the kidneys were normal.

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[1] Lancet, London, August 3, 1895.

[2] Thèse de Paris, 1891, quoted by Ransohoff.

Of sixteen cases of anuria treated by nephrotomy, ten recovered, the mortality being therefore 37 per cent., which contrasts very favorably with 71.5 per cent., the mortality after expectant treatment. These results have led Ransohoff to divide nephro-lithotomies into those of necessity and those of choice.

Anuria may result from obstruction of both ureters by calculi or more usually by obstruction of one ureter and reflex arrest of function in the other kidney.

The immediate prognosis will depend largely upon the nature of the operation which the condition present demands. Simple nephrotomy for calculus or abscess is much less serious than the continued presence of the offending substance. Of five cases operated on by Morris, one died of general tuberculosis following secondary nephrectomy performed only as a means of relief. "The former four cases received great benefit from it, and it is, perhaps, hardly too much to say owed their lives to the operation." In the cases here reported, all made satisfactory recoveries, and the statement just quoted could with entire truthfulness be applied to them. Without operation, the disease tends to a fatal termination from perforation of the abscess into an important region, from hectic and exhaustion or amyloid degeneration. Thornton[1] reports 115 operations on the kidney, with seventeen deaths (14.5 per cent.); of forty-seven cases of incision into the kidney for abscess, stone, etc., there were five deaths, less than 11 per cent.

The mortality after nephrectomy for these conditions is variously stated at from 33 to 50 per cent., the fatal result being usually ascribed to absence or disease of the other kidney. Thornton[2] reports forty-nine abdominal nephrectomies with but ten deaths, a mortality of about 20 per cent. These figures still further emphasize the necessity of early operation when nephrotomy will meet all the indications.

[1] Lancet, London, January 11, 1896.

[2] Loc. cit.

The incision that has been employed in these cases is that usually recommended, beginning just below the last rib, close to the outer border of the erector spinæ muscle and continued downward and forward towards the iliac crest. The incision should be made three to four inches in length, according to the thickness of the abdominal wall, and may be increased, if necessary, by prolonging the cut outward.

After nephrolithotomy on a kidney otherwise healthy, immediate suture has been carried out by Le Dentu, Morris, Israel, Fenger, Bernays, Tuffier, Garard, Marchant, Rose, and Ransohoff. In most cases, however, drainage has been used. In all of those here recorded a drainage-tube was inserted into the renal incision, and if there had been much disturbance another into the pocket below and behind the kidney, and iodoform packing loosely introduced. If there was persistent hæmorrhage in the deeper portion of the wound, this was controlled by firmer packing with gauze. The wound was partly closed by sutures including all the layers of the parietes. The tubes were removed as early as was thought safe, always within a few days, and replaced by a strip of gauze, which did not interfere with healing to the same extent as the firm tube. Excessive packing of the wound is said to have caused death in the practice of Ransohoff and Israel, the pressure of the gauze on the nerves of the mesocolon and behind the parietal peritoneum causing intestinal paralysis.

Ransohoff urges fixation of the kidney in every case in which its relations have been considerably disturbed in the manipulations incident to the operation.

REPORT OF SPECIFIC CASES.

CASE I.—*Abscess of Kidney; Nephrotomy.*—A. S., male, aged forty-six years, came under the care of Dr. Edward Kerr, of Downingtown, Pa., by whom he was sent to Dr. White for operation. The following history was obtained upon his admission in the University Hospital. During the past five or six years, the patient had complained of an almost constant, dull, aching pain between the last rib and the crest of the ilium. At times there were attacks of acute pain. He was able, however, to continue his work until three weeks before admission. At this time his suffering was so acute that he was obliged to remain in bed. The pain was much aggravated by lying on the right side.

On examination a tumor was distinctly felt in the region of the right kidney. A zone of resonance on percussion could be elicited between the margin of the liver and the tumor. Several examinations of the urine showed a specific gravity of 1010, a small quantity of albumen, considerable pus, and some uric-acid crystals. The symptoms so strongly suggested pyonephrosis that operation was recommended.

The lumbar incision, already described, was employed. The tissues divided were found to be swollen and œdematous, suggesting perirenal suppuration. The kidney was enlarged and the capsule was thickened. The gland being well pushed up into the wound by the hand of an assistant on the surface of the abdomen, it was carefully examined for calculus, both by palpation and by the exploring needle with negative results, but an area of fluctuation was found. It was incised at the latter point and the opening enlarged by the finger, when about four ounces of pus escaped. The subsequent steps consisted in irrigating the cavity, and vigorously sponging its walls to remove as much lymph and diseased tissue as possible, in the introduction of a large rubber drainage-tube, two interrupted sutures at either end of the incision and a sufficient quantity of iodoform gauze to fill the wound, the whole being covered with a liberal dressing of antiseptic gauze. The wound was dressed daily, being irrigated on each occasion. On the second day the tube was removed and drainage secured by iodoform gauze solely. Rapid improvement followed; the patient being allowed to return to his home at the end of a month. At this time the wound was nearly healed and the pus had almost disappeared from the urine.

A letter received from Dr. Kerr states that "S. looks to be in perfect health. He says he feels better than he has for years and is able to do the hardest work without discomfort. He cut wood all day yesterday without any pain or inconvenience, something he has been unable to do for fifteen years. He now weighs 137 pounds; his usual weight in health had been 123 pounds, when he came to the hospital he had become reduced to 100 pounds, on his return from the hospital and before going to work he weighed 166 pounds. His weight had never exceeded 138 pounds before the illness." The following report of the examination of the patient's urine was very kindly sent with the letter: "Urine passed after the mid-day meal, —color, normal; reaction, acid; specific gravity, 1020; albumen absent; sugar absent; sediment, almost none at the end of twenty-four hours; microscopically, in three slides were found one oxalate-of-lime crystal and a few epithelial cells. There was no pus present."

CASE II.—*Abscess of Kidney; Nephrotomy.*—Dr. White was called in consultation by Dr. Herzog, of Oley, Pa., and Dr. Loose, of Reading, to see Mrs. K., who, about four months before, began to complain of indefinite symptoms. On July 2 she had a chill, which was repeated almost daily. The urine was examined at this time, and no pus or other abnormal constituent was found. In the latter part of August pus was observed in the urine for the first time. On September 16 the patient began to complain of pain in the left lumbar region, and a week later a swelling could be detected in the region of the left kidney. The patient had fever of an irregular type and showed evidence of profound septic intoxication. The urine at the time of operation contained pus and blood. With this history, an exploration of the left kidney was imperative.

An incision was therefore made as in the last case and an enormous abscess evacuated. The kidney was found to be nearly if not quite disorganized. The cavity was irrigated and thoroughly swabbed out and drained. Recovery was slow, but progressive.

Seven months after operation, Dr. Herzog writes: "I saw the patient to-day; she is really doing well; she eats heartily. The urine is free from albumen, but contains some pus. The sinus still persists, and discharges a little pus."

CASE III.—*Abscess of Kidney; Nephrotomy.*—Mrs. J., aged twenty-seven years, was sent by her physician, Dr. Schuman, of Jerseytown, Pa., to Dr. James Tyson, at whose request Dr. White saw the patient. The case will be published in full by Dr. Tyson; only a brief history will therefore be given here. In the summer of 1894 the patient complained of considerable pain in the right flank. She was pregnant at this time. She had a short but hard labor, and was up in the usual time, but did not recover her health properly. The pain in the back and right side (for a time both sides) was constant, but subject to exacerbations, and was especially severe after being about all day. The patient was unable to secure comfort in any position, and was in bed and out alternately as she became tired of each in turn. The pain extended down into the right groin, the right thigh was flexed upon the abdomen constantly and any attempt to straighten it caused severe pain in the lumbar and inguinal regions, being most pronounced in the latter. The urine was examined several times, and was found to contain urates, oxalate-of-lime octahedra, leucocytes in excess, at times a little blood, some albumen always, and in two instances one or two casts. The temperature was irregular, reaching up to or a little above 100° F., and once above 103° F.

Examination showed some tenderness on pressure over the right kidney, but nothing more. Under ether a cord-like body could be felt through the abdominal wall in the course of the right ureter. Two attempts to pass a catheter along the ureter from the bladder resulted in the instrument being arrested each time at a point corresponding with the body to be felt through the abdominal wall. No urine whatever escaped through the catheter. The diagnosis was uncertain, but the symptoms seemed to point to either renal or perirenal abscess.

It was decided to explore the kidney, which was exposed by the incision before described, and the organ carefully palpated in all directions with negative results. An exploring needle was then introduced at several points, and when the lower portion of the gland was reached pus appeared in the groove of the needle. With the needle as a guide, an incision was made in the convexity, the wound enlarged with the finger and two or three ounces of pus evacuated. The cavity was gently curetted and irrigated. The finger was again introduced and a careful search made for a calculus, but none was found. The character of the pus, and the presence of some scattered cheese-like deposits in the cortex led to the belief that the trouble was tubercular. The wound was dressed as above described. The patient made a rapid convalescence. In a few days the right thigh could be extended, the temperature soon fell to normal and there remained. The patient rapidly regained her usual health. She was heard from recently and still remains perfectly well. The wound had healed promptly and gave no further trouble. The letter contained many expressions of gratitude for the relief from her former suffering.

CASE IV.—*Abscess of Kidney; Nephrotomy.*—Hugh W., aged sixteen years, was seen in consultation with Drs. J. M. Da Costa and R. M. Girvin. His father died of heart-disease (mitral). One brother has a phthisical tendency, while another brother had a fistula.

The patient has had measles, mumps, whooping-cough, chicken-pox, and a light attack of scarlet fever. At three and a half years he had a severe attack of double pneumonia and pleurisy, and at six an attack of malaria.

About six weeks before the date of the present note he began to have indefinite symptoms, one of which was pain in the right lumbar region. A few days preceding this he had noticed a throbbing in the same spot. Since then he has been in bed, during which time thirty-two pounds in weight have been lost. He has had no chills, but has perspired freely occasionally. The temperature has suggested suppuration. The bowels have been regular, the urine has shown nothing abnormal.

In spite of the most careful attention to the diet and hygiene of the patient and the use of such medicinal measures as seemed indicated, his condition had not improved.

On examination, in addition to the emaciation and general appearances of illness, the fever and accelerated pulse, there was noted a distinct bulging and tenderness in the right lumbar region posteriorly, Suppuration in or about the corresponding kidney seemed to be the most probable condition. The other organs appeared to be healthy. Examination of the urine revealed the following: Urine for twenty-four hours, May 2 to 3, 1896,—quantity, 71 ounces; color, yellow; reaction, alkaline; odor, putrid; specific gravity, 1008; microscope showed a fair amount of red blood-corpuscles; no leucocytes or albumen.

With this evidence Dr. White had no hesitation in urging an operation. This was performed on May 4, 1896. An abscess of considerable size was opened and a collection of pus of a distinctly tuberculous appearance was evacuated. The abscess cavity surrounded the lower and posterior portions of the kidney, the lower segment of which was also excavated. The abscess was, doubtless, at first renal, and by extension or pressure necrosis perirenal also. After the usual cleansing of the wound two drainage-tubes were introduced, one in the renal cavity and the other behind the kidney, and a loose tampon of iodoform gauze introduced.

Convalescence was rapid and uninterrupted. The patient left the hospital at the end of two weeks; the wound was being dressed daily and was closing in as fast as could be expected. The appetite returned and flesh was rapidly regained, for a time the increase was seven pounds per week. The wound was entirely healed about the middle of July, and the patient now is in the very best of health. After the operation the urine rapidly became normal in quantity and appearance, and a recent examination shows that this condition continues.

CASE V.—*Abscess of Kidney; Nephrotomy.*—Mrs. M., aged twenty-eight years, was seen by Dr. White in consultation with Dr. George W. Guthrie, of Wilkesbarre, Pa. Six months before she had had the appendix removed for chronic appendicitis. The patient was always constipated, the bowels moving only by the administration of laxatives.

The present trouble began with pain in the left lumbar region. There was some fever of an irregular type and an occasional chill. Later fulness and tenderness developed in the splenic region, and the left thigh was flexed to secure greater comfort. There had been several attacks of what appeared to be renal colic. By a careful consideration of the symptoms the renal origin of the trouble appeared to be certain, and the operation confirmed this view,

The usual lumbar incision was made, the kidney exposed, and an abscess found just beneath the capsule. This was evacuated and the cavity irrigated, sponged out and packed with iodoform gauze. The wound was redressed daily. The patient made a perfect recovery.

CASE VI.—*Abscess of Kidney; Nephrotomy.*—William W., aged twenty-two years, was sent to Dr. White at the University Hospital. He gave the following history: Father living, mother died of consumption at forty-three. Two aunts and one uncle on the mother's side died of consumption. One brother and two sisters living and well. When a child he had measles and whooping-cough. At thirteen he had an attack of acute rheumatism, confining him to bed between three and four months; three weeks of this time he was delirious. At fourteen years of age he worked in the mule-room and weaving-room of a cotton-mill, where he was exposed to a dusty atmosphere. When sixteen years of age he took up harness-making and has been at this kind of work up to two weeks ago. Has been troubled with severe catarrh of the nose and head as long as he can remember. Always caught cold easily.

Three or four months ago he caught a severe cold, which left him with a cough; weight at that time 138 pounds; began to sweat at night, the sweats appearing at five o'clock in the morning; commenced to expectorate a greenish sputum, which has increased since in quantity. Five or six weeks ago a pain appeared in the small of the back, which made him think his kidneys were affected. Has never had any bloody urine. Three years ago had his first attack of gonorrhœa, and a year and a half ago a second attack; considered himself perfectly cured. Chews tobacco constantly. Is a periodic drinker of beer and whiskey, formerly going on a spree once a week; appetite always good, has been very constipated.

Present Condition.—He feels weak and languid, has a swimming sensation in the head, and a pain in the region of the kidney. His cough does not bother him very much. Weighs 120½ pounds as compared to 138, his maximum (height, five feet six inches). Appetite is good, tongue slightly coated, fever of an irregular type was present; pulse 80 and of good volume; respiration 22. He feels chilly at night and warm during the day.

Physical Examination.—Inspection negative. Palpation recognizes increased vocal fremitus below the right clavicle as compared with the left. Percussion: Impaired resonance above and on the right clavicle; posteriorly the scapulæ are prominent and the outer ends of the clavicles are seen distinctly from behind, left shoulder slightly more sloping; otherwise percussion negative. Vocal fremitus slightly increased in the right supraspinous fossa. Auscultation negative.

Examination as to his renal condition, with the patient on his back, revealed a relative fulness on the right side extending from the umbilicus into the flank as contrasted with the left side, the swelling sloped off more rapidly from the umbilicus into the left flank.

With the patient on his face and the back to view a slightly greater prominence in the right flank was apparent, while there was the same marked tenderness always noted in this region. The urine contained pus, one-twenty-fifth by bulk, and albumen, but no casts were found.

The diagnosis of tubercular renal disease on the right side seemed justified, and the patient consenting, the kidney was exposed by the usual method. The organ was found to be enlarged, and contained a collection of typically tubercular matter. The operation was concluded and the after-treatment carried out as in the cases before described. The temperature rapidly fell to the normal line and remained at this point, and the general condition improved as satisfactorily as could have been hoped for.

Case VII—*Abscess of Kidney; Nephrorrhaphy*—was seen by Dr. White in consultation with Dr. William Pepper. Mabel B., aged sixteen years, has had measles and chicken-pox, but no other diseases of childhood.

When four years of age she fell down-stairs from top to bottom (about a dozen steps), and had several other slighter falls. She never had an attack of pain before this fall. The first attack came on some months after the fall mentioned, and lasted eight hours; others followed this at intervals; they were often accompanied by vomiting.

An attack generally lasted four, six, or eight hours, and usually came on during the night. For several days after the right side of the abdomen was very sensitive and a lump could be felt through the abdominal wall. Before the operation she had an attack usually once or twice a week, except on two occasions, when six weeks each time were passed without one.

Indiscretion in diet and over-exertion would bring on an attack, and exposure to dampness and especially catching a cold would usually be followed by one of her characteristic spells.

On New Year's day (1896), she was exposed to cold. The pain came on that night, and continued more or less severely for a week. This was the first time it lasted so long. Hot applications and rest in bed assisted very much in relieving her. She was not able to give any accurate account of how often the attacks occurred before her eighth or ninth year of age, but thought two or three times a year or every few months. Mabel says that for some months before the operation she often only voided urine once in twenty-four hours, and then not a large quantity. Has been treated for "neuralgia of bowels," "liver trouble," "kidney trouble," etc.

All of her grandparents are living and in good health, except the maternal grandmother, who is described as having "an awful cough and delicate stomach." She has had this cough for the past eighteen years, and is worse in the winter-time. Mabel's great-grandfather (maternal) died from consumption, which developed from a heavy cold. A maternal aunt died of consumption.

On examination the right kidney was found to be plainly movable; as no other abnormal condition could be detected, and as this seemed to account for her symptoms, nephrorrhaphy was decided upon. At the operation the kidney was found to be elongated, of a lighter color than normal, and felt soft to the touch, so soft, in fact, as to give the idea that it was colon. This was thought to be an example of a mild hydronephrosis due to the movable condition and consequent twist of the ureter. The capsule was stitched to the lumbar fascia with kangaroo tendon, the muscles united with catgut, and the skin with silkworm gut. On the second day it was necessary to remove part of the stitches on account of a high temperature, when an abscess of the kidney, apparently tubercular, was evacuated and drained. This had not been apparent at the time of the nephrorraphy. It may have been the condition which was taken for a hydronephrosis. The wound was thereafter dressed daily, and, although convalescence was rather slow, it was none the less complete and satisfactory. There has been no recurrence of the symptoms noted before operation.

CASE VIII.—*Renal Fistulæ; Nephrotomy.*—Miss C., aged twenty-seven years, was sent to Dr. White by her physician, Dr. Ellsmore Stites, of Bridgeton, N. J., on account of persistent fistulæ in the right groin, which were discharging profusely. There was a history of renal colic some years before; one fair-sized calculus having been passed by the urethra. The history of her illness subsequent to the attack of renal colic was one of constant pain on the right side, with fever and considerable constitutional depression. The treatment appears to have been entirely expectant and without any regard whatever to the renal condition. Finally an abscess appeared in the right loin and opened spontaneously. The patient drifted from one physician to another during this time, still without the renal origin of the trouble being surmised. Finally she consulted Dr. Stites, who recognized the surgical nature of the trouble and sent her at once for operation. The sinuses which led to the kidney were opened freely and the organ exposed. An abscess cavity, containing three or four ounces of pus, which had not been draining, was detected and evacuated. It was apparent, however, that the bottom of the trouble had not been reached, for sinuses ran in different directions; one, for example, going deeply into the pelvis and another up under the diaphragm so far that they could not be followed to their terminations. It was necessary to conclude the operation after all suppurating tracts accessible had been dealt with. There was profuse hæmorrhage from the kidney, but it was readily controlled by packing, no stitches being introduced. The patient was very much benefited as a result of the better drainage; she gained rapidly in color, in flesh, and in general health, which she maintained for many months.

A second careful but persistent effort to deal more radically with the diseased kidney had to be abandoned on account of the wide-spread ravages of the process. Hæmorrhage was also very free and could be controlled only by packing. A similar marked improvement followed and the patient seemed in her usual health; the sinuses persisted, however, and continued to discharge.

At a later period it again became apparent that the foci were not being satisfactorily drained. Fever and symptoms of septic intoxication occurred. The health had failed perceptibly. The sinuses were enlarged, but no attempt was made to do more, as the patient's condition was so critical as to make such a procedure one of the greatest hazard to her life, and the previous examinations had demonstrated the futility of any attempt to remove the extensive area of disease. Death occurred some months later from amyloid degeneration of the viscera. This patient's life was certainly much prolonged by these conservative operations.

CASE IX.— *Renal Calculus; Nephrolithotomy.*— Henry C., aged twenty-nine years, a carpenter, had an attack of left renal colic in December, 1894. At this time the pain was severe, starting in the region of the left kidney and extending towards the right testicle, which was retracted. There was another slight attack in the same kidney three weeks later. Since this time the attacks occurred on an average every two weeks, but were always confined to the right side. After an attack, a large amount of urine was passed. The patient sometimes vomited during the paroxysm. The interval of freedom from pain was becoming less and less. Seven or eight calculi, the size of a small pea, had been passed, and gravel was frequently observed. The patient came to the University Hospital on April 24. Attacks of renal colic are noted on the 24th, 26th, 27th, and 28th. The urine was dark in color, the specific gravity was 1022; reaction, alkaline; there was considerable albumen and a large amount of pus; no casts were found. There was no tumor to be felt in the right loin. The diagnosis was renal calculus.

Dr. White cut down on the right kidney, May 1. The most careful examination with the fingers and the exploring needle did not succeed in locating a stone. The convexity of the kidney was then incised and the finger introduced into the pelvis, which seemed free from any concretion. A sound passed towards the ureter came in contact with a calculus just beyond the apex of the renal pelvis. This was extracted with forceps. The patient returned to his home at the end of one month, with the wound healed, having had no pain during the convalescence. The calculus weighed eight grains.

CASE X.—*Renal Calculus; Nephrolithotomy.*—Miss J., aged twenty-three years, was seen in consultation with Dr. Edward P. Davis. The history was that of a sudden severe pain in the lower portion of the abdomen and groin of the right side. The thigh was kept flexed as the patient was more comfortable in this position. On the evening of the same day the patient vomited, and this was repeated on the two succeeding days. On the second day after the symptoms began there was a feeling of distention in the abdomen and some constipation, but the pain had subsided. In the evening the patient had a chill and considerable abdominal distention. An enema was given which was followed by the most acute cutting pain on the lower right side of the abdomen. There had been some fever throughout, which during the chill reached 104$\frac{1}{5}$° F. The abdomen was distended and so tender that palpation was unsatisfactory, but a decided fulness low down on the right side of the abdomen could be detected.

The symptoms seemed to point so strongly to an inflammation of the appendix that an operation for its removal was undertaken. The usual incision was made and the appendix easily brought out of the wound. It was found to be entirely normal in every respect, and was therefore returned. The fingers in the wound detected, however, a large, tense, fluctuating, retroperitoneal swelling, which seemed to be the right kidney. The abdominal wound was therefore closed and sealed with iodoform collodion, and the usual lumbar incision made for exposing the kidney. It was found to be the seat of hydronephrosis. The organ was incised and a large quantity of clear fluid evacuated. The kidney was then explored for calculus, but none found. Finally, on passing a sound into the ureter a small calculus was detected and removed. The kidney was stitched to the wound, drained, the external incision partly closed by sutures, and the usual dressing applied. Six weeks after the operation the patient had an attack of pain on the right side during a menstrual period. It was thought that perhaps another calculus was lodged in the ureter, and an attempt was made to pass a catheter from the bladder up to the kidney. On two separate occasions when the attempt was made the catheter was arrested at the same point, which was estimated to be at about the middle of the ureter. The patient made a perfect recovery, however, and is to-day in excellent health, and as active as at any period of her life.

It should be stated that on examining the abdomen after the patient had been etherized the mass was not at all like that usually found in connection with appendicitis. But the subject of her renal condition had not come up, and had therefore not been studied. Careful inquiry into her history afterwards elicited the fact that she had had attacks of pain in the right side of the abdomen and back since she was nine years of age. The attacks were sometimes repeated several times in one year, and at other times two or more years might elapse without a paroxysm. During the attack there would sometimes be a chill and vomiting. In the twenty-first year the pain recurred at each menstrual period successively for eight months; one severe attack was precipitated by a horseback ride. Up to the time of operation the pain was distinctly aggravated during the menstrual period.

A more careful inquiry into the history mentioned would almost certainly have prevented the error which is here recorded. The anterior incision, however, did not inconvenience the patient to any degree, and the convalescence was in nowise delayed or made more irksome.

Case XI.—*Renal Fistula; Renal Calculi; Nephrolithotomy.*—W. D., a blacksmith, aged fifty-five years, was sent to the University Hospital by his physician, Dr. Frederic Corss, of Kingston, Pa. The patient's history, as far as it relates to the present trouble, was as follows: In October, 1892, pain was felt in the left loin. He continued with his work, but by December it was so severe that he was obliged to give up and remain in bed. In January, 1893, a fluctuating swelling appeared in the left loin, which was opened and a large quantity of pus evacuated. The wound never healed, but continued to discharge pus. In the following May he resumed work, at which he has continued until March of the present year. Two years ago the patient says he passed two small calculi through the lumbar sinus.

Examination revealed a sinus about four inches deep leading in the direction of the kidney, but as no urine appeared by this channel, it was uncertain whether it was connected with the kidney or merely an infected sinus. This was promptly settled, however, by injecting into the sinus a solution of methyl-blue. A catheter was immediately passed into the bladder through the urethra, and the methyl-blue solution withdrawn, thus establishing the connection of the sinus with the kidney. The urine contained a considerable quantity of pus and albumen, but no casts.

Nephrotomy was decided upon with the view of providing better drainage, and to permit of a thorough exploration of the organ. On opening the kidney near the sinus several small calculi were found and removed. No other abnormal condition could be found, and the operation was concluded by introducing two large drainage-tubes, one in the kidney incision and the other behind it, and the usual iodoform-gauze tampon. The operation was performed October 28. The patient suffered but little or no inconvenience, and he was soon going about as usual. The wound has been dressed daily and is rapidly diminishing in size.

CASE XII.—*Movable Kidney; Nephrorrhaphy.*—Mrs. H., aged thirty-five years, was sent to Dr. White by Dr. Appleby, of Tyrone, Pa. Three years ago she was seized with a pain beginning below the costal margin on the right side, extending below the umbilicus, and also felt in the back. There was some vomiting of mucus. The pain left on the following day, but tenderness persisted in the affected region for a week. Two months ago she had a second attack, which was accompanied by nausea and vomiting and diarrhœa. Six weeks ago a third attack came on, also accompanied by vomiting. At this time the urine was noted to be dark in color. Since this time she has been nervous and weak. Recently the patient has observed a tumor in the right side of the abdomen at times.

On examination a movable kidney was easily detected. Otherwise the patient appeared healthy. The urine was normal in every respect.

Nephrorrhaphy was performed June 10. The usual lumbar incision was employed, the patient being in the prone position, and an Edebohls's rubber bag placed under the abdomen to force the kidney up into the wound. The organ appeared healthy in every respect. The capsule was split and sewed to the lumbar aponeurosis with silk sutures. The muscles were united with catgut and the skin with silkworm gut. The patient made a good recovery, and at the last report had had no return of her former attacks.

CASE XIII.—*Movable Kidney; Nephrorrhaphy.*—A. R., male, aged thirty years, first experienced pain in the right groin three years ago. He was in bed for a week during this attack. He was constipated during this time and passed considerable mucus. These attacks recurred, and recently the pain has been almost constant, but with acute exacerbations. His suffering was so acute that he had been obliged to give up work. When the pain was severe he would be obliged to walk the floor, frequently losing an entire night's sleep. The right kidney was found to be somewhat movable, and after very carefully considering the case nephrorrhaphy was decided upon. The operation was performed as in the preceding cases. Primary healing took place, and rapid convalescence followed. He was kept in bed for three weeks in order to permit the kidney to become firmly fixed by adhesions. He left the hospital entirely relieved of his former distress.

CASE XIV.—*Tubercular Kidney; Nephrectomy.*—The patient described as Case VI, upon whom nephrotomy had been performed with the most satisfactory result for a time, began to have a hectic temperature, the daily extremes amounting frequently to 5° F., rapid pulse and other evidences of a recurrence of the former condition. On probing the deep portion of the wound, which was at this time a sinus nearly healed, a focus of suppuration was opened. The kidney was found by palpation to be enlarged. The condition seemed to demand extirpation of the affected kidney as it was improbable that simple drainage would prove curative.

Nephrectomy by the abdominal route was performed on May 29, this method being adopted because of the large size of the organ. The incision was made parallel with and along the outer border of the right rectus muscle. The peritoneum was opened by an incision external to the ascending colon, the kidney loosened from dense adhesions by which it was bound at different points and made to present in the wound. The pedicle was then grasped by large pressure forceps and divided on the distal side of the latter. The pedicle could then be dealt with deliberately and each structure recognized, which would have been very difficult with the kidney *in situ*, as it was enlarged to nearly or quite six times its normal dimensions.

When all bleeding had been arrested, a gauze drain was brought out through the old lumbar sinus, and another through the abdominal wound; the latter being stitched up to the point of exit of the gauze.

The patient, being feeble before the operation, was not more shocked than was to be expected. A pint of normal saline solution was given by hypodermoclysis as a precaution against secondary shock and with very good results. The temperature immediately fell after this operation and improvement in the general condition occurred. The kidney removed was infiltrated throughout, no healthy secreting structure remaining. During the first twenty-four hours thirteen and a half ounces of urine were passed; the daily quantity gradually increased and averaged about thirty ounces. The wounds gradually contracted, and when the patient left the hospital a quite narrow sinus with practically no discharge marked the site of the gauze drain in the lumbar and abdominal wounds.

CASE XV.—*Perirenal Abscess; Evacuation.*—A. B., aged twenty-eight years, a Russian, unable to speak English, was referred to Dr. White by Dr. F. A. Packard, to whose wards, at the Philadelphia Hospital, he had been admitted. No history whatever could be obtained. The symptoms were high fever, reaching 104° F., acceleration of pulse and respiration, malaise, anorexia, etc., that accompany fever, particularly when of septic origin. Locally the left loin was found to be more prominent than the right and was very tender on pressure. Fluctuation could not be detected.

The swelling was cut down upon by the same incision, and upon opening the lumbar fascia an abscess cavity containing a large quantity (estimated at one quart) of offensive pus was evacuated. The kidney did not seem to be involved. No cause for the suppuration was apparent. After the usual cleansing, the cavity was packed with gauze, and dressed daily thereafter. The fever declined to the normal point within a few days, and convalescence was rapid and complete, the wound healing firmly and the general health being restored.

CASE XVI.—*Nephralgia* (?); *Nephrotomy.*—Alexander G., aged forty-four years, began to have attacks of pain in the left kidney six years ago, which were so severe as to require the administration of morphine. Altogether there have been five or six attacks in the left kidney and two in the right. For the past two years there has been so much continuous pain that he was obliged to give up work. He had been struck in the left loin with lumber on different occasions, all of which were previous to the present symptoms, however. When the patient came under observation, June 17, 1895, he complained of a burning sensation in the region of the left kidney and in the epigastrium. No tumor could be felt in the loin.

A diagnosis of possible renal calculus was made, and exploration of the kidney decided upon. A thorough examination by the finger and exploring needle did not yield any information. The convexity of the organ was incised and the finger introduced into the pelvis without detecting a calculus. Neither was any pus found. Hæmorrhage from the kidney incision was so profuse that the examination had to be terminated as speedily as possible and the wound packed with gauze. The patient complained of pain in the wound for a few days, after which the convalescence was rapid and uneventful. The pain which had been so severe before the operation was entirely relieved. The patient returned to his home at the end of twenty-four days apparently cured.

CASE XVII.—*Perinephritic Abscess from Intestinal Neoplasm.*—Mr. S. was seen by Dr. White in consultation with Dr. William Pepper and Dr. Todd, of Pottstown. His troubles began with cramps and borborygmi, and a little diarrhœa. Four months later, after severe cramps and a chill, he was confined to bed for a week. After this time, the chills recurred about once a week. A tumor now appeared in the right lumbar region, and steadily enlarged. Vomiting had recently been a distressing symptom. The patient was much emaciated. Examination revealed a tumor in the right side of the abdomen about the size of a child's head. There was a history of having passed a renal calculus twelve years ago and again two years before coming under observation. The seat of the tumor, the presence of pus in the urine, and the septic condition of the patient seemed to point to renal neoplasm. Although there was evidence of partial intestinal obstruction, it was thought that this was probably due to secondary involvement. An exploring needle was introduced through the loin and a little purulent matter withdrawn. This seemed to confirm the diagnosis, and the usual incision for nephrotomy was made in order to expose the tumor. On account of the changed relations of the adhesions and the depth of the wound, this was not very satisfactory. The capsule of the growth was opened, and when explored with the finger it was found to be made up of a soft pultaceous mass, resembling the interior of a broken-down tuberculous gland. The mass was found to be distinct from the kidney, but connected with the colon. It was impossible to remove the growth on account of the involvement of adjacent structures, and, as the patient's condition was very low, the wound was closed, after having provided for drainage.

At the conclusion of the operation, the patient's temperature was 98° F., and the pulse 108. But one and a half fluid ounces of ether had been used. He gradually sank and died in a few days.

LAMINECTOMY FOR SIMPLE FRACTURES, WITH A REPORT OF THREE CASES.[1]

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LAMINECTOMY may be defined as the excision of a portion of the neural arch, or of the entire neural arch, of one or more vertebræ. The classes of cases for which it is indicated, judging from reports of operators covering the period of the last ten or twelve years, are grouped in a general way as follows:

(1) For fractures, both simple and compound, of the laminæ or pedicles or both; (2) for fractures of the bodies of the vertebræ; (3) for dislocation of the articular processes; (4) for hæmorrhage, both extra- and intradural; (5) for tumors lying within the vertebral canal; (6) for osteomyelitis of the bodies or laminæ, either acute suppurative or tubercular (Pott's disease); (7) for tubercular meningitis and pachymeningitis; and (8) for wounds, inflicted either by bullet or knife. But this last class, if accompanied by fracture, would naturally come under the head of compound fractures.

It is understood, of course, that any case of any one of these groups must show the regular symptoms of compression of the cord or cauda equina in order to render complete the indications for laminectomy.

My personal experience with the operation is limited solely to cases of simple fracture of the laminæ, and the number of these cases is three. But I desire, before reporting them, to call attention to a few points which have occurred to me in looking over the literature of the operation. In doing this I shall limit myself chiefly to laminectomy for simple fractures.

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[1] Read before the New York Surgical Society, October 28, 1896.

In the first place as to the *mortality* following the operation for all cases. This, as is well known, is exceedingly large. In fact, this rate of mortality is, without doubt, *the* great objection to the operation, and perhaps justly so, in the minds of many surgeons.

As given by Lloyd, of 103 cases, 50 per cent. died after the operation; by White, of 37 cases, 38 per cent. died; while of 52 cases collected by Pyle, 29 per cent. were fatal. Now in making these percentages not only these observers, but all others whom I have noted, commit the error, it seems to me, of putting all the cases together and then striking an average. In other words, no distinction is made, in computing percentages, as to the *region* operated upon, and this, in spite of the fact that one region stands out conspicuously in all these reports as being attended by far less mortality than any other. This is, of course, the region of the extreme lower dorsal and the lumbar vertebræ.

Almost every reporter of cases of laminectomy has one or more "lumbar" cases which do well. That is, they survive the operation, and are, at least, improved even if actual recovery of motion and sensation is never regained, and especially is this true for cases of simple fracture. Thus, Dr. R. H. Dawbarn reported to the New York Surgical Society, in October, 1894, complete recovery of a case of laminectomy for simple fracture of the neural arches of the eleventh and twelfth dorsal vertebræ, performed two hours and a half after receipt of the injury; W. C. Arnison, of Manchester, England, reports three cases of laminectomy all for fracture of the laminæ of the first three lumbar vertebræ:

First case: Operation performed four weeks after receipt of injury. Result: Patient walked out of the hospital. Second case: Operation seven days after injury. Result: Great improvement in general condition, with slight increase of muscular power. Third case: Operation two years after injury. Result: Improvement in the cystitis and bed-sores.

Dr. J. A. Wyeth, in April, 1894, reported to the New York Surgical Society the following: Simple fracture of laminæ of last two dorsal and first lumbar vertebræ. The bodies were also crushed. Laminectomy seven months after injury. Result: Four years later "good use of lower extremities. No anæsthesia above knees."

Dr. E. P. Riggs, of Birmingham, Ala., operated, four days after the injury, for the fracture of laminæ of last dorsal and first two lumbar vertebræ. Result: "Sensation as far down as the knees. Each foot can be slightly moved."

Dr. W. L. Pyle, of the Emergency Hospital, Washington, whose list of percentage of mortality has been already referred to, reports performing laminectomy for fracture of the first lumbar arch six days after the injury. Result: General condition good; disappearance of severe girdle-pain, persistent before the operation; bed-sores healed. No improvement in the paralysis. From the list prepared by this same gentleman I have extracted seventeen cases of laminectomy for fracture, one of which is stated definitely to be in the lumbar region. This case, as well as all of the others, recovered from the operation. Of the sixteen cases in which the site of the operation is not given, fourteen are improved and two have restoration of function.

J. A. Romeyn, of Amsterdam, gives four cases of entire recovery of function following laminectomy for fractured laminæ in the lumbar region; and Villar, a French surgeon, after operating for a similar injury four days after receipt of the same, states, as the final result, that only anæsthesia persisted.

It seems, therefore, from a clinical stand-point, that it is only reasonable, in computing percentages of mortality, to keep by themselves *all cases* of laminectomy in the lumbar region, and especially those done for fracture, since we should then have a distinct class with a greatly diminished death-rate.

My own experience is in harmony with the above. Of my three cases, two were for fracture in the lumbar region, and both are living and greatly improved.

Morse[1] makes this positive statement, "The prognosis after laminectomy is worse the higher the operation is performed." That these cases should be considered by themselves receives further support from anatomical considerations, as already suggested by Thorburn.

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[1] The Occidental Medical Times, June, 1895.

The spinal cord is a very complex organ, increasing as it ascends, both in its complexity and its sensitiveness to injury, whether inflicted directly by bony pressure or indirectly by means of the shock of an operation.

In the cervical region *any* injury to the cord seems especially dangerous to life, not only because of its inherent structure, but also because of the easy transmission to the medulla oblongata of the effects of such injury.

On the other hand, in the lumbar region of the vertebral canal—*i.e.*, from the lower border of the body of the first lumbar vertebra downward—there is no cord, but instead the cauda equina, a bundle of long, comparatively strong nerve-roots, far more resistant than the delicate cord, not only to the pressure effects of the fracture, but also to the shock which results from the subsequent operation for relief.

Trusting that I have made my meaning sufficiently clear in regard to the mortality rate, I pass on to the questions of the *time of operation* and of *diagnosis*.

The diagnosis of simple fractures of the laminæ is, fortunately, easy in the vast majority of cases, and especially so in the lumbar region. This was true both in my own cases and in those already detailed. Furthermore, this diagnosis was promptly followed by operation, the delay in two of the cases reported being due not to the operator but to the length of time which elapsed before the patients came under observation.

I state these facts for the reason that I have noticed in the reports of a good many other cases a disposition to delay the operation even when the diagnosis was clear, such delay being due apparently to the desire of making the diagnosis surer by excluding other possible causes and of locating exactly the point of pressure by means of elaborate tests of the various areas of anæsthesia and of the various groups of muscles paralyzed. These procedures are, of course, eminently right and strongly indicated as preliminary to a laminectomy when the actual cause of pressure and its location are really unknown, but in the light of many recent reports they seem at least unnecessary if not actually harmful, as causing delay in cases of simple fracture of the laminæ of which the diagnosis is reasonably clear.

My opinion, therefore, reinforced as it is by my own cases of lumbar fracture, each of which was operated on as soon as it was possible to do so, is for immediate laminectomy in all cases of fracture of the lumbar laminæ, of which the diagnosis is clear, and which present the usual symptoms of compression.

Fractures of the *bodies* of the vertebræ are usually considered hopeless and as contraindicating operation. But as the exact diagnosis of such is rarely if ever made, except during a laminectomy for accompanying fractures of the laminæ, it would seem as if the abstract consideration of these fractures, with which the literature of laminectomy abounds, is of purely theoretical and pathological importance, and cannot be of great practical interest.

I may be allowed to summarize the foregoing as follows:

(1) In order to diminish the rate of mortality, all cases of lumbar laminectomy should be kept strictly by themselves in computing the death-rate.

(2) The advisability of avoiding all attempts at making too fine a diagnosis and at locating too exactly the point of pressure when both are reasonably clear, as they usually are in cases of fractured laminæ, because all delay beyond what is demanded by the general condition of the patient is harmful.

The histories of my own cases of laminectomy are as follows:

They will be referred to as No. 1, No. 2, and No. 3. Nos. 2 and 3 had fractures in the lumbar region, and No. 1 in the upper dorsal. All three cases were operated upon in my service at Bellevue Hospital, and each one presented the regular symptoms of total loss of power and sensation in the lower extremities, areas of anæsthesia on the trunk according to the height of the injury, incontinence of urine and fæces, and all developed bed-sores within two or three days.

The diagnosis was readily made by palpation in all three, and in the lumbar cases the operation was performed within forty-eight hours of the receipt of the injury.

CASE NO. 2.—*First Lumbar Case.*—Male, aged twenty-seven years. While in a stooping posture was struck on the back by the fall of a piece of heavy timber. The operation was done in September, 1895. The incision revealed an impacted and depressed fracture of the laminæ and pedicles of the twelfth dorsal and of the laminæ of the first lumbar vertebra. There was also a dislocation between the first and second lumbar vertebræ. The fractured portions were removed by the use of a Hey's saw and rongeur forceps, and the dislocation was reduced after removal of the obstructing portions of the respective articular processes.

The dura mater was not opened, as there seemed no indication for doing so. The wound was packed. Good recovery from the operation. During the following two or three months no improvement, bed-sores increased, and cystitis developed. After that time these conditions became better and sensation began to return in the legs. Present state, thirteen months after operation, is as follows: Appetite and general condition good; no cystitis and a very slight ability to control sphincters of bladder and rectum; operation-wound is healed; large bed-sore over sacrum persists, but is growing smaller; sensation almost entirely restored to lower extremities, but no gain at all in the muscular power.

CASE NO. 3.—*Second Lumbar Case.*—Male, aged forty-five years; was thrown to the ground, a distance of about ten feet, while endeavoring to alight from a railroad train. Laminectomy was done October 6, 1896. The incision revealed fractures of the laminæ of the second and fourth lumbar vertebræ, which were depressed and somewhat impacted. Removal was effected without difficulty. As in the former case the dura was not opened. The third lumbar arch was intact, and, as the flat end of a probe could be passed readily beneath it, there seemed no necessity for cutting it away. The spinous processes of the last three dorsal vertebræ were found loose and were removed. The wound was sutured above and below and packed in the centre. Good recovery from the operation.

Present condition, after three weeks, is fairly satisfactory. No bed-sore has developed over the sacrum, while those over the buttocks, which appeared during the short interval between the receipt of the injury and time of operation, are definitely healing. There is consciousness of the acts of urination and defecation, although there is no control of the same, such consciousness being entirely absent during the first week. No cystitis has appeared. Sensation is slowly spreading downward on the legs, being present below the knee on the right side and extending to about the middle of the thigh on the left. Furthermore, the patient is conscious, as he puts it, of "having legs," and of a tingling sensation all the way down to and including the feet, as if both legs were partially asleep. These feelings have developed within the last fortnight. There is no evidence as yet of any return of muscular power.

CASE No. 1.—*Upper Dorsal Region.*—Male, aged twenty-three years. Fell from the seat of a truck striking on his back. Local examination showed marked deflection to the left of the middle line of the spinous processes of the fourth, fifth, and sixth dorsal vertebræ. During the four days following the accident he presented the usual symptoms, and in addition a high temperature, averaging 103° F. On the fifth day this dropped to normal, and there was also noticed a distinct upward advance of the girdle of anæsthesia on the trunk. Laminectomy was at once performed, the date being early in July, 1890.

The incision confirmed the diagnosis and showed a depressed, impacted fracture of the left laminæ of the fourth, fifth, and sixth dorsal vertebræ. The arches of these vertebræ were removed by the use of the chisel and rongeur forceps. The dura was fully exposed; appeared normal. It was, nevertheless, opened for a short distance. The cord was also found apparently normal both to sight and touch.

No depression above or below the opening could be detached by the passage of a probe between dura and arches. The dura was sutured and the wound packed. Good recovery from the operation and entire recovery from the effects of the ether.

About six hours after the operation there came on suddenly convulsions of both upper extremities, which lasted about five minutes, and were followed by paralysis. The patient then lay perfectly paralyzed, except for rapidly failing respiration, for about ten minutes, when he died. The autopsy was entirely negative, the vertebral canal being opened up to the skull. A section of the cord extending between limits taken well above and below the affected area was submitted to a microscopical examination by Dr. Walter James, who reported an apparently perfectly normal cord.

This case is a good illustration of the fatality of this operation when performed on the higher regions of the cord, and especially of those cases where the shock of the operation alone seems to be the cause of death.

In conclusion, I desire to comment on two points of operative technique,—viz., the use of mallet and chisels in raising the fractured bone and the opening of the dura mater.

Both of these procedures, in my opinion, increased the shock of operation in this last case, and should not again be employed by me under similar circumstances. Opening the dura, except where there is unmistakably a large intradural hæmorrhage, is at the best a measure of merely diagnostic value. It cannot help the patient.

As to chisels, the hammering necessary to their use must certainly add to the shock, and when, as has been my experience, the object in view can be attained just as well by comparatively gentle sawing, followed by the use of the rongeur forceps, it would seem wiser to abandon the use of the chisel altogether in favor of that of the saw.

THE EFFECTS OF SMALL CALIBRE BULLETS AS USED IN MILITARY ARMS.

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SINCE France, in 1886, adopted the small calibre of 8 millimetres as its military arm various nations have followed its example, and replaced their larger calibres of 10.75 millimetres to 12.50 millimetres with those ranging from the 8 millimetres of Austria, France, and Denmark down to the smallest, that of the United States naval rifle, of 6 millimetres, recently adopted.

The causes which led to this reduction in the size of the bullets did not relate to the different effects produced by the smaller-sized missile, but solely to the increased ballistic properties and convenience of the new charge.

During the ten years which have intervened since the introduction of the small calibre arms, the character of the wounds produced by them have been much studied and contrasted with those inflicted by the larger calibres.

These studies have been largely of an experimental character, as there has been no great war in which the effects of the small calibred bullet could exhibit its true properties on such an extensive scale as to determine its value as a weapon of warfare, and furnish sufficient data to afford a proper comparison with its larger, old time rival. Our civil war was fought with weapons ranging in calibre from a .50 to .58 inch, or 12.50 to 14.50 millimetres, and in our medical and surgical history of that war will be found ample records of the effects they produced. The results of the small calibres have been shown in a limited way in the fighting in the civil war in Chili, in which the 7.6 millimetres Mannlicher rifle was used; in some of the contests of the English troops with the half savage occupants of their Eastern possessions, in which the 7.7 millimetres Lee-Metford was used; in the Japanese-Chinese war, in which the former used the Murata rifle of about 8 millimetres (.315 inch); in the Abyssinian campaign, in which the Italians used the 6.5 millimetres Mannlicher-Careano rifle; in the present Cuban rebellion in which the Spanish soldiers are armed with the 7 millimetres Mauser rifle, and, finally, in a certain number of more or less minor isolated instances. The conclusions arrived at from a survey of these practical tests have not been as satisfactory towards the establishment of the efficiency of the new arm as were the experimental effects derived by governmental commissions.

The question which is now raised is whether the experimental results produced on dead bodies can be accepted as exemplifying the wounds which surgeons will be called to treat in future wars? Are they as severe on the living body as it has been shown they are on the dead? and how will they compare with the wounds received in previous wars?

Colonel Stiles,[1] in discussing the question of the efficiency of the new arm, says he thinks it may be answered in the affirmative, yet he concludes by saying that the wounds it produces offer the surgeon an extremely favorable field for his labors, while materially lightening them. Thus practically stating that the new bullet does not produce such severe wounds as the old. Before discussing the relative disabling power of the new and old arms, let us briefly review the facts discovered concerning the principles of gunshot wounds in general, and also the properties of the small calibres.

The United States has adopted two calibres. The larger, .30 inch or 7.62 millimetres, for the army and .236 inch or 6 millimetres for the navy. The experiments made have been principally with the larger calibre, which is also very near those adopted by most foreign powers. The bullet has a length of four diameters or thirty millimetres and is composed of a compressed lead interior and German-silver jacket.

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[1] Journal of the Military Service Institution, November, 1894.

A gunshot wound is produced practically by two forces, one, penetrative, in the axis of flight, and the other, lateral, or transverse to the axis of flight.

This lateral effect when it exists in any considerable degree has been termed explosive. Therefore we can define explosive effect as a marked destruction of the tissues surrounding the track of the bullet. Inasmuch as the missiles usually used are projected from rifled arms, they have a third effect due to the rotation which is thereby given to them.

In many gunshot wounds there are no appreciable effects due to this rotary force. This is evidenced by the fact that at its start the bullet only makes one rotation on its axis for every nine inches of its flight, and as its velocity decreases so does the rapidity of its rotation. When a bullet perforates a part it often remains in it too short a time for its rotary action to manifest itself. When, however, a bullet is arrested in a part and expends all its energy on it then there are rotary effects produced. Evidences of this was shown in the spiral markings obtained by Henrad and the twisted markings in clay obtained by Horsley. The tendency of a rotary motion of the projectile is towards a lateral effect on the tissues, therefore increasing its explosive action. Kocher from his experiments considered that it exerted so little influence on the character of the wounds that he did not consider it appreciable, and described the explosive action as being independent of it.

Horsley, also from his experiments, states that as far as the brain is concerned little destructive action is to be ascribed to it, while Lagarde apparently did not think it important enough to take into consideration at all. This leaves the two forces, penetrative and lateral, alone to be considered.

Every gunshot wound is the resultant of these two. In some the penetrative predominates, in others the lateral.

The primary or initial force is an onward, propulsive, or penetrative one, and it is only when resistance is encountered that a part of it is transformed into a lateral one. The whole of the propulsive force is never transformed into a lateral or explosive one, a part of it is always consumed in penetration. When it is expended on penetration the bullet leaves a clean track through the tissues, but when it is expended laterally there then is tearing and disintegration of the tissues extending far beyond the track of the ball. There are several factors which cause a wound to assume either a penetrative or explosive character.

As a rule, penetrative effects are directly proportional to,—(1) The hardness of the projectile (non-deforming). (2) The softness (elasticity and compressibility) of the tissues. (3) The velocity of the bullet. (4) The small size (frontage) of the bullet. (5) The weight of the bullet.

The hardness of the bullet prevents its being deformed on striking the tissues; therefore, the energy which would be disseminated by this deforming of the bullet is preserved and aids it in penetrating deeper. This is seen in the relative penetration of bullets as shown by Lagarde. A .30 inch calibre German-silver jacketed projectile penetrated five and three-tenths inches of solid oak, while the harder steel-jacketed one of the same calibre and velocity penetrated nineteen and a half inches. The .45-inch calibre lead projectile at a somewhat lower velocity only penetrated three and one-fifth inches.

The softness or compressibility and elasticity of the tissues also aids a bullet in its flight by being easily penetrated or displaced instead of resisting progress, as does bone, for example.

It is evident that increased velocity should produce an increased penetration, but this is only so to a certain extent, because the resistance to the entrance and passage of a bullet increases as the velocity increases, and it does so in a more rapid ratio than does the penetration, so that a point is soon reached beyond which any additional velocity is simply expended laterally on the tissues instead of producing an increased amount of penetration.

With the same amount of initial energy imparted to bullets of the same weight but different diameters, the penetration of the bullet of less diameter would be the greater. This is on account of the less frontage presented by the ball, and consequently the less resistance offered to its entrance.

The greater the weight of the bullet the greater is its inertia. It requires more energy to start its flight, and consequently greater resistance to stop its progress.

Therefore, a wound by a small, hard projectile impelled through soft tissues at a suitable velocity would present the characters of a simple perforation without any marked injury to the structures adjoining its track. Such wounds occur quite commonly and are the least dangerous. The lateral effect, which when marked is termed explosive, of a projectile is proportional.

(1) To the softness of the bullet,—easily deformed. (2) To the hardness and non-compressibility of the tissues. (3) To the velocity of the bullet. (4) To its large size (frontage). (5) To its weight. (6) In a slight degree to the rapidity of rotation on its axis as imparted by the rifling.

The softness of a bullet favors lateral action by spreading out sideways instead of penetrating onward. On this account lead bullets at certain ranges produce greater destruction of tissue than do the metal-jacketed ones. So well known is this, that for hunting purposes soft lead-nosed bullets are especially made. The parting of the hard metal jacket from the leaden core also increases the destructive action. Lagarde estimates it to occur in 10 per cent., but others regard this as being somewhat too high; it probably varies considerably.

The harder and less compressible the tissues are into which the bullet penetrates, the more is its penetration checked, and therefore the greater is the lateral expenditure of its energy. A bullet may enter a bone only a short distance, yet it will split it for a considerable distance. Water is practically incompressible, therefore tissues containing it transmit the force imparted by the bullet to a very marked degree. The explosive action of bullets is seen to be much greater in the bladder, stomach, brain, liver, and spleen than it is in the muscles, lungs, or intestines.

The lateral effect increases rapidly with the increase of velocity. The injured tissues, so to speak, have not time to be pushed aside to make way for the bullet, but are torn to pieces and carried onward and thrust latterly with great destruction of the surrounding parts. A flying bullet striking a bone shatters it and sends the pieces into the surrounding tissues, and not infrequently tears a great hole through the part as it emerges. The soft but incompressible tissues of the liver, spleen, and brain, when entered by a bullet at high velocity, are apt to be reduced to a disorganized, pulpy mass.

The greater the size or frontage of the bullet, the greater will be the amount of tissue which it displaces in its passage and the more resistance will it encounter. Small bullets will frequently slip through a part without injuring it, but a large bullet will tear the surrounding tissues severely. Bullet wounds from the small-calibred revolvers are often not serious, but those of the large-calibred weapons will almost always be of a dangerous character. So true is this that if a disabling effect is desired a big frontage is obtained either by using a large-sized bullet or so preparing it as to cause its expansion on striking the object.

An increase in the weight of the bullet is accompanied by a marked increase in its lateral action. This is due to its greater inertia. It is a well known fact to hunters that small game shot with a round, light ball is not mutilated nearly so much as when shot with the heavier conical projectile when moving at the same velocity. The influence of the rotation of the projectile on its axis, as shown in wounds inflicted by it, is slight. It exhibits its characteristics by the irregularity of the injury inflicted in the surrounding parts.

We have defined explosive effect as a marked destruction of the tissues surrounding the track of the bullet, and have endeavored to show that it is nothing more than the lateral transmission of a considerable proportion of its initial energy.

According to Horsley, Hugier, in 1848, first pointed out that the marked disturbance (or explosive effect) produced in the soft organs was due to a dispersion in a hydrodynamic manner of the water contained in these organs;[1] also that Kocher had gone over the same ground, and that Kramer and himself had fully confirmed the experiments, and that the effect is really a hydrodynamic one. To attribute explosive action to a single cause is, however, hardly correct. Explosive action is simply a marked degree of lateral action, and lateral action, as detailed above, is shown to be the resultant of at least six different conditions, which, being combined or present in different degrees, produce the lateral destruction of the tissues. Sir William MacCormac[1] also states that the pressure is not strictly a hydraulic one. Horsley himself shows that in gunshot wounds of the skull and brain the explosive effect is most marked on the side of entrance. When muscular tissue alone is traversed by the ball the explosive effect is almost *nil*, but if a bone is traversed, then from that point it is marked. This is due not to any special hydrodynamic action, but to the hard bony splinters which are detached and driven onward by the force of impact. This is so true that Lagarde and others considered a large wound of exit in the extremities as being indicative of extensive bone lesion.

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[1] Sir William MacCormac credits William Busch with this suggestion, Lancet, August 3, 1895.

Delorme[2] claims, and Stevenson[3] agrees with him, that too much importance has been attached to the hydraulic theory.

Coming now from theory to fact, let us see the application of the above general principles to the special wounds produced by the recently introduced jacketed missiles of small calibre and high velocity. Owing to the fact that the recently invented firearms are used for war purposes, the wounds they produce have been studied by a large number of individual experimenters and government experts. Space will allow of allusion to only a few. The missile adopted by the United States for use in the army is an average type. It is cylindro-conoidal in shape, weighing 220 grains, 7.62 millimetres or .30 inch in diameter, four diameters in length, and composed of a leaden core surrounded by a German-silver mantle or cover. It is impressed with a muzzle velocity of 2000 feet per second. The discarded arm used a compressed leaden ball 11.25 millimetres or .45 inch in diameter, weighing 500 grains, with a velocity of 1300 feet.

The following results are deduced from experiments on dead bodies and other inanimate objects by the more recent experimenters, Bruns, Von Beck, Von Bardeleben, Reger, and Von Koler and Schjerning (the German Commission), of Germany; Delorme, Nimier, and others, of France; Habart, of Austria; Demosthéne, of Bucharest; Kocher, of Switzerland; Horsley, of England; and Lagarde and Griffith, of our own country.

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[1] Lancet, August 3, 1896.

[2] Chirurgie de Guerre, Vol. XI, p. 996.

[3] Lancet, March 9, 1895, p. 610.

When the earlier experiments were made, the opinion, as voiced by Bruns, was more or less general that the new arm was more humane in regard to the wounds it produced than the older weapons. Later experimenters, as Demosthéne, held that it was more destructive. Lieutenant Stiles, United States army, in a careful review, considered it less humane than had been claimed. Major Halley regarded the small calibre as the more deadly. Griffith[1] evidently considered it extremely destructive. He states that at distances up to 1000 yards the explosive quality of the missile is terrific. Major A. C. Girard, in commenting on the results obtained by Kocher and the German Commission, stated that it is evident from both series of observations that the more humane effects are a myth.

The vulnerating effect of the United States army gun of 7.62 millimetres or .30-inch calibre was considered so firmly established that when, a couple of years later, the government wished to rearm the navy, the calibre was still further reduced, and one 6 millimetres or .23 inch was adopted. The results of experiments by the 7.62 millimetres or .30-inch calibre alone are here considered.

The *skin-wound* of exit of the .45 inch or large calibre is larger than the wound of entrance, while of the small calibre there is not much difference unless a bone is struck, when it also is much larger. Greater hæmorrhage was expected from the small calibre, but this has not yet been positively determined.

Muscles.—Explosive action on the muscles is not marked unless the bone is injured. It is less marked than on the liver and spleen. At short ranges there is a perforation about the size of the bullet or a little larger, and at longer ranges somewhat smaller.

Bones.—On these a somewhat different effect is produced on the diaphysis and epiphysis. At short ranges the explosive action is very marked, splintering and comminuting the bone for great distances from the track of the ball. As the distance increases beyond about 400 yards (Kocher, 350 Girard) the splinters are not so extensive nor so completely detached from the periosteum and surrounding parts. Simple perforation of the shaft of long bones is comparatively rare at any range. On the epiphyses, however, perforations occur sometimes even at short range, and are the rule at long ranges. The comparative effect of the two calibres on the bones at distances from 500 to 1200 yards is well summed up by Stiles, who says, "There is none of the splintering, comminution, and scattering of fragments always caused by the old ball at these ranges." Lagarde states that beyond the explosive zone, which he limits to 350 yards, the small hard bullet almost invariably perforates or gutters the epiphysis, and that the lesions to the joint are never severe. The flat bones are commonly perforated without extensive crushing and fracturing. The smaller-sized long bones are badly broken in the region of impact. Griffith found the clavicle comminuted for one inch at 1000 yards, and the ulna one and a half inches at 600 yards.

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[1] Paper read before the Association of Military Surgeons, 1895.

Skull.—It is on the skull and brain that the small calibre bullet produces its worst effects. At almost all distances, certainly up to 1000 yards, it fractures the bone extensively and disorganizes the brain. According to Kocher, explosive effect is shown even up to 1100 metres' distance, and at longer distances perforations. The disorganization at short ranges is terrific.

Chest.—Tearing of the lung only occurs when a rib has been fractured and the pieces driven onward.

Tendons.—Griffith found that at 600 yards the tendons were not injured, but pushed aside. At greater velocities they would be torn.

Abdomen.—The abdomen is perforated at almost the extreme range of the bullet,—over 3000 yards. There are usually from three to eight wounds when the *intestines* are involved (German Commission). On the liver and spleen particularly explosive action is marked. On the kidney to a less extent.

Liver.—Kocher found pulpification of the liver up to 700 metres, while the German Commission found it present up to 2000 metres.

Spleen is injured to the same extent as the liver. Griffith found it almost split in half at 500 yards.

Kidney badly torn, but hardly to same extent as the spleen and liver.

General Considerations.—From the results of the earlier experimenters, particularly Bruns, it was thought that the wounds of the small calibre bullet would be less severe than those made by the larger, slower, and softer one. Then came Demosthéne and Habart, who claimed that the 6.5 millimetre Mannlicher inflicted worse wounds than the old arm. They were supported by Brunner,[1] and to a certain extent by Von Koler and Schjerning, of the German Commission, who seemed to get more severe results from the small calibre than others. Kocher and Major Lagarde, on the contrary, did not consider the effects worse. Major Griffith concludes that the explosive effects up to 1000 yards are terrific. The German Commission and Griffith experimented by shooting at bodies at the actual distances, therefore the severe results obtained by them, as pointed out by Girard, may be due to the bullet being more easily deflected,—*i.e.*, not keeping end on, but turning to a certain extent either before or after entering the tissues. Kocher and Lagarde experimented at a distance of twenty-eight to thirty yards with charges reduced to give the proper velocities.

Turning now from the theoretical to the actual, from experiments on dead bodies to an observation of effects on living ones, some very interesting facts are developed. It is found that living tissue does act differently from dead tissue. The armament of most of the large nations was decided on before the small calibres were given any thorough trial in actual service. An opportunity was afforded the English to observe the effect of their new Lee-Metford rifle, 7.7 millimetres, in the Chitral campaign.

Surgeon-Lieutenant Gould[2] collected twenty-five or thirty cases and reports twenty of them in detail. He did not know, however, at what distances the wounds were received, nor did he have an opportunity to examine the dead. He says,—

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[1] Correspondenzblatt für Schweizer Aerzte.

[2] British Medical Journal, July 20, 1895.

"There can be little doubt that from a humanitarian point of view the Lee-Metford rifle is a perfect weapon. The bullet obviously inflicts very little damage on the soft tissues, and on the bones its action is apparently not very severe, preferring rather to go through a bone than to badly fracture it." Again, "From the little experience I have had in injury to bone tissue by the Lee-Metford bullet, I certainly think it causes but slight shock, and doubt its capacity of putting a man out of action." One man was shot through the sacrum and in three weeks was ready to fight again; another was shot through the olecranon and upper part of the shaft of the ulna; rapid recovery took place with good movement of the elbow. Another was shot through the lower portion of the radius; the wound healed rapidly with fair movement of the wrist and fingers which was improving daily. Compare the course of these wounds to what they would have been with our old .45-calibre arm? Another was shot through the face, the bullet entering below the right malar bone and coming out below the centre of the lower border of the left zygomatic arch,—of this patient it is said he had no severe symptoms, nor pyrexia during treatment, and will soon be well and none the worse for being shot. The wounds pursued an extremely favorable course, the healing being very rapid.

Major Girard[1] saw the case of a convict who was shot through the head at short range with the new United States Kräg-Jorgensen rifle. The explosive effect was marked, the skull being shattered and the brain disorganized. He states, "When the first experiments with the small calibre gun were made, it was found that occasionally the epiphysis of a bone showed an almost clean perforation, and the rash conclusion was drawn that the new class of weapons, instead of shattering the bones and tearing the flesh, would make almost a punctured wound; therein they would be more humane." This he characterizes as a fallacy, and adduces the foregoing case in proof of his position. He appears not to take into consideration the facts that the distance was only ninety feet, or thirty yards, and that the injury was inflicted on a part of the body which shows most markedly the destructive action of the small-calibred missile. Almost any arm would probably have produced just as severe effects under similar circumstances, and the .45-calibre probably greater.

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[1] Journal of the American Medical Association, October 19, 1895.

During the late Chinese-Japanese war the Chinese soldiers used mostly old arms, but the Japanese had some troops armed with the Murata rifle of 8 millimetres, although the bulk of the troops were armed with a heavier calibre. According to the Pioneer,[1] reports received from China showed that the Murata rifle inflicted wounds like the Lee-Metford (both being about the same calibre). It says "the Chinese soldiers wounded in action experienced no difficulty in getting away, even after being hit by two or more bullets. They had to trust to kindly nature to heal their wounds. This she did in a most marvellous fashion in many cases, and China must now contain many hundreds of so-called soldiers who owed their lives to the invention of the small-bore rifle. In the decisive actions it was a rifle that carried a much heavier bullet that did the real execution."

Sir William MacCormac[2] states that in the Chitral Expedition, according to Surgeon-Lieutenant H. Burden, who was present at three actions, as far as he could see and hear from others, the wounds through the soft tissues, at both long and short ranges, were clean and incised, with very little or no bruising, and that they quickly healed. Through the bones clean, punched-out holes were made with little splintering, and he said in no case was there any explosive action. The damage caused by the large-bore bullets of the enemy was much more severe. Also Surgeon-Lieutenant Evans reports that these cases healed rapidly and well, notwithstanding the use of dressings very far from aseptic applied by the men themselves. The natives, however, said in reply to questions, that "all the men who had suffered fracture of long bones were dead."

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[1] Journal of the Military Service Institution, November, 1895.

[2] Lancet, August 3, 1895.

As throwing some light on this point, an examination of the twenty cases already alluded to, reported in detail by Surgeon-Lieutenant Jay Gould, shows that the following long bones were hit without very serious fracture: Ulna, 2; humerus, 2; radius, 3; fibula, 1; tibia, 2; femur, 1.

Seydel[1] gives the details of fifteen cases treated by himself. In two cases the soft parts alone were affected and healed without pus. In two the phalanges were shot through. They recovered with pseudarthroses (without the loss of the finger). Of three abdominal wounds, two were shot through the liver and died, while the third recovered with a fæcal fistula. Two shot through the lungs recovered without difficulty, while six shot through the head or skull died. When there was any chance at all for recovery it took place rapidly.

General Lowe, who commanded the leading column in the Chitral campaign, is quoted by the *Washington Post* as saying, "Often prisoners were brought in with two or three bullet-holes through them that seemed to cause the wounded men but little inconvenience, for they had been marched six and seven miles before they reached our bivouac. These prisoners accounted for the extraordinary absence of the dead enemy on the field by saying that unless a man was shot through the head or bowels he did not die, and nothing but a wound in the joints of the lower limbs disabled him. I am clearly of the opinion that for fighting savages the old .45-calibre arm should be used. The Chitralis had a .45-calibre rifle, and they disabled or killed a man whenever they hit."

As evidence of the correctness of this latter statement, our own chief of ordnance, General Flagler,[2] says that for close range the .45-calibre is superior to the new .30 calibre.

Quoting General Lowe again, he says, "We had to execute a spy. The firing party, with eight rifles loaded with bulleted cartridges and four with blanks, fired on him at fifteen paces. The prisoner was hit six times, three shots piercing his chest. He, on being unbound, started and ran a quarter of a mile before he was overtaken by a mounted Sikh, who cut his head nearly off at a single blow with his sabre." The same paper states that a German murderer received the fire of nearly an entire platoon and tried to escape. The sergeant at the head of the firing party shot the wretched man through the head, but did not kill him. He reloaded his piece, and while the wounded man was lying on the ground begging for his life the sergeant placed his rifle behind the prisoner's ear and killed him. He had received nine wounds before he died.

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[1] Münchener medicinische Wochenschrift, February 11, 1896.

[2] Army and Navy Journal, August 8, 1896.

It is interesting to recall, in this connection, that in Brigadier-General Griffith's experiments, one of the bullets entered to the left of the sternum, in the second intercostal space, one-half inch to the left of the median line passed through the sternum to the left of the trachea and above the arch of the aorta, and made its exit one-half inch to the right of the second dorsal vertebra. There were no fractured bones nor damage to the vital parts or organs. Imagine the effect of a .45 calibre bullet pursuing a similar course? A field officer, writing in the *Morning Post*[1] (Calcutta), is quoted as saying that "the effect of a bullet, particularly a light one, fired at a high initial velocity, is far greater on dead than on living flesh and bone. In the latter there would really appear to be some resisting quality, for which we must confess ourselves unable to account, not possessed by dead flesh and bone. An express bullet usually forms a crater in the flesh of a dead animal, and breaks up the bones; whereas in a living one it seems to be turned aside by the least obstruction and merely passes through the body." He also states that he has shot a large quantity of game in India, chiefly with a .36-express, but has never seen in the animal shot while living the terrible wounds made by the same rifle on a dead carcass.

The lack of disabling power by the new small calibre arms has attracted the attention of the military authorities both of this country and abroad. The United States authorities examined into the question at Springfield and decided to retain the present small calibre German-silver jacketed projectile on account of its superior ballistic properties and power of dislodging troops behind breast-works, etc. In the recent fighting in South Africa, the British troops were unable, by their rifles alone, to stop the onward rush of the natives, and it was only the opportune assistance of the machine-guns that saved them from being overcome by the savages.

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[1] Journal of the Military Service Institution, September, 1895.

The Italians in their campaign against the Abyssinians were not so fortunate. The disabling effect of the Mannlicher-Carcano rifle of 6.5 millimetres, with which they were armed, were so slight that it was thought that the ammunition might have been tampered with. The natives overcame the Italians with most frightful slaughter.

To conclude, I would submit,—

(1) That the initial force of a bullet is an onward or penetrative one.

(2) That when penetration is impeded, the onward force becomes transformed into a lateral one.

(3) That explosive effect is only another name for lateral action,—*i.e.*, outside of the track of the bullet.

(4) That lateral action is most marked in hard bones (the fragments being carried onward) and in organs containing water (bladder, brain, liver etc.).

(5) That practically the rotation of the bullet on its axis does not materially affect the character of the injury.

(6) That the effect of gunshot-wounds is not so severe on the living body as on the dead.

(7) That the destructive power of the small calibre arm has been over-estimated.

(8) That its stopping or disabling power is less than that of larger calibres.

(9) That wounds in future conflicts will be, as a rule, less severe and healing more rapid, with fewer complications than has been the case in the past.

(10) That less radical treatment will be required and conservatism will be followed by most brilliant results.

URETERO-URETERAL ANASTOMOSIS.[1]

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THANKS to the pioneer work of Pawlik and Kelly, we are rapidly brushing away the clouds from the pathology and treatment of the upper urinary tract. The urinary organs are so intimately associated with the female generative organs, both in position and function, that the interest of the gynæcologist must be drawn to their abnormal conditions. The work of the gynæcological specialist cannot be limited to the reproductive organs. The rectum and bladder have already claimed his attention, and the ureters and kidneys are also applicants for the same honor.

In this direction a great field for study is presented, and we believe it is the gynæcologist that is destined to enlighten the profession on the diseases and treatment of these latter organs. Kelly, Pawlik, Fenger, Küster, Van Hook, and others have started us in the right direction, and we will rapidly increase our knowledge of the yet unknown functions and pathology of the ureters and kidneys.

Definition.—Our conception of uretero-ureteral anastomosis is the approximation of adjacent portions of the ureter so as to remove the interruption of its function due to partial or complete section of this organ by accident or otherwise. This meaning does not contemplate such cases as have been reported by Küster,[28] Mynter,[33] and Fenger,[14] in which they have done such excellent work on the portion of the duct adjoining the pelvis of the kidney. While the kidney pelvis is of the same anatomical construction and function, yet it has not the same shape and size as the ureter, and therefore surgical treatment of it is more easily executed and without the danger of stricture or fistula remaining. Nor do we allude to such vaginal work as has been done by Emmet,[13] Parvin,[35] and others; or, even, to the lowest two inches of the organs, as a rule, for it would probably be too difficult to be carried out, transperitoneally, in this portion. Besides, the vesical graft is probably more advantageous here, notwithstanding the difficulty of making a proper duct-ending by that operation. Nor can it be applied when a considerable extent of the duct is destroyed. It is scarcely necessary to state that uretero-ureteral anastomosis does not comprise the implantation of this organ into vagina, rectum, ileum, or even to the surface of the body.

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[1] Read at the meeting of the Southern Surgical and Gynæcological Society at Nashville, Tenn., November 10, 1896.

Kelly has given to this operation the name "uretero-ureterostomy," a term of whose propriety we do not feel confident. Yet as no critical objections to it are apparent, its use would seem to be warranted by its convenience.

History.—So far as we could learn from the library of the surgeon-general's office the operation has been very rarely attempted on man, and never previous to Schopf's[44] case, in 1886. We have found recorded eleven cases, and wish to place on record one that occurred in our own experience. We are obliged to think that many more cases have been reported, but not under titles indicating them, thus rendering them nearly inaccessible. For instance, Cushing's[9] case was found by reading a report by him of "Rare Forms of Myomectomy," in one case of which he was obliged to repair, in this manner, a cut ureter. Probably many have occurred, both successful and otherwise, that have not been reported. So that it will be seen that this extremely important part of ureteral work has been neglected. This is readily apparent when we remember the great work done by Pawlik, Kelly, and others in the treatment of constrictions, inflammations and calculi in this duct. Perhaps more striking would it appear if we call attention to the many kidneys that have been sacrificed for injuries to this tube.

Anatomy.—In order to better understand the matter under consideration, it will be well to refer briefly to the anatomy, anatomical relations, and physiology of the ureters.

The ureters are two small elastic tubes that convey the urine from the kidneys to the bladder. They are continuations of the pelves of the kidneys down to the bladder, and have a diameter of three to four millimetres, with a lumen about equal to that of a "goose-quill." Their length is given by different authors to be from ten to sixteen inches; Sappey, as quoted by Glantenay,[17] p. 16, says ten to twelve inches, Henle,[19] eleven to thirteen inches, Tanquary,[49] according to Van Hook,[21] says ten to twelve and never more than fifteen inches, while Quain[41] puts it fourteen to sixteen inches. This diversity of opinion upon what would seem to be so easily determined is probably due to the contractility of the ureteral walls, and to measurements being applied to this organ within the body by some and by others after its removal. The structure of the canal is as follows: An external fibrous coat, a middle coat of plain muscular tissue, and a mucous lining. Cabot[7] says bands from the fibrous coat intimately connect it with the peritoneum throughout its whole extent, and Glantenay and other authors hold to the same opinion. According to Huschke and Obersteiner (Quain) the muscular coat possesses two layers of longitudinal fibres and a middle circular layer. Henle finds only an inner longitudinal and an outer circular layer, while Kölliker, who admits the inner longitudinal and circular as the principal layer, describes longitudinal fibres external to the circular layer which are absent at the upper part of the tube (Quain). Wendt[53] gives the following description of the lining: "The mucous membrane, thin and smooth, presents a few longitudinal folds when the ureter is laid open. It is prolonged above to the papillæ of the kidney, and below becomes continuous with the lining membrane of the bladder. It is stratified, consisting of at least three layers of cells, variously shaped and large. The most superficial layer consists of flat or polyhedral cells of various sizes, each one containing a round or oval nucleus, or, as frequently happens, two nuclei. Then comes a layer of conical or club-shaped bodies, each one again furnished with a round or oval nucleus. Every cell also possesses a long basal process, which appears to attach it to the subjacent tissue. The bulbous portion of these corpuscles is turned outward in the direction of the surface. Wedged in between the processes just mentioned we find the third variety of cellular elements. These are oval or rounded bodies containing ellipsoid nuclei."

The lymphatics are well developed here, forming several net-works in the different layers of the ducts, and the blood is supplied from small branches of the renal, the spermatic, the internal iliac, and the inferior vesical arteries. The veins end in various neighboring vessels.

The ureter has three points of diminution of calibre; first, at one and a half to two inches from the pelvis of the kidney; second, at the junction of the pelvic and vesical portions, and a third, when present (found in three out of five cases), where it crosses the iliac artery. These should be particularly remembered in dealing with constrictions of this duct.

The course of the ureter is as follows: At first it passes obliquely downward and inward to enter the cavity of the true pelvis, having in this portion of its course a slight convexity towards its fellow of the opposite side. The pelvic portion, less than one-half of the duct, is more strongly curved, almost the arc of a circle, with its convexity directed towards the lateral wall of the pelvis, until it finally reaches the neck of the bladder (Fenger[14]), the wall of which, according to Bell,[3] it penetrates so obliquely that it runs from one-half to three-quarters inches between the muscular and mucous coats before finally opening into that viscus. Its shape then is much like the letter S reversed. Tourneur[51] says, "The course of the abdominal portion of the ureter in the false pelvis corresponds to a vertical line erected upon a point at the junction of the internal and middle thirds of Poupart's ligament. We consider it directly vertical from the border of the kidney down to the small pelvis, over the brim of which it passes four and a half centimetres from the median line. The exact location of this point is the intersection of a horizontal line drawn between the anterior superior iliac spines and a vertical line passing through the pubic spine."

Bell (p. 178) says, "It will be observed that the orifices of the ureters are not closed by the muscular fibres around them. They are defended against the return of the urine by the obliquity of their passage through the coats of the bladder. It is well known that the extremity enters through the coats of the bladder obliquely, and in consequence of this, there is a valvular action in the coats of the bladder which prevents the regurgitation of the urine into the duct of the kidney." Again, on p. 176, he states, "On dissecting up the inner coat of the bladder, there are seen two strong fleshy columns, which descending from the orifices of the ureters towards the orifice of the bladder they unite and run towards the prostate gland. On the surface, towards the cavity of the bladder, they are denser by the union of the inner coat of the bladder, but they are fibrous, and this fibrous structure is made manifest by dissecting from below. They are larger and firmer, but of the same color and structure with the fleshy columns of the *detrusor urinæ*. The variety which we find in their length according to the degree of contraction of the bladder proves their muscularity. Whatever excites the action of the bladder increases the size of these muscles in a remarkable degree, and they always acquire a great deal of power and size when the muscular coat of the bladder becomes more distinct and powerful. In some of my specimens of diseased bladder I find this to be caused by stone in the bladder, in others, an ulcer; in many, stricture; but always irritation, and the necessity of continual action of the bladder is attended with an enlargement of the muscles of the ureters." The influence of these so-called "muscles of the ureters" over the orifices of these canals is explained as follows by him: "If we consider the subject, we shall find that in proportion as the bladder contracts this obliquity must be diminished, and further, if all reflect that the coat which contracts is on the outside of the oblique passage of the ureter, we shall conclude that without some counteracting power on the inside of the bladder to draw down the orifice of ureter, the obliquity of the passage would be lost. These muscles which I have now described, guard the orifices of the ureters by preserving the obliquity of the passage, and by pulling down the extremities of the ureters according to the degree of contraction of the bladder generally." This remarkable study was published in 1812. A corresponding musculature exists in the female bladder and has the same function. Gouley, of New York,[18] mentions these muscles, and cites their excited action in certain bladder affections.

Anatomical Relations.—Of the anatomical relations of these ducts Quain says (p. 417): "In its whole course it lies close behind the peritoneum, and is connected to neighboring parts by loose areolar tissue. Superiorly it rests upon the psoas muscle, and is crossed, very obliquely from within outward below the middle of the psoas, by the spermatic vessels, which descend in front of it. The right ureter is close to the inferior vena cava. Lower down the ureter passes over the common or external iliac vessels behind the termination of the ileum on the right and the sigmoid flexure of the colon on the left side. Descending into the pelvis it enters the fold of peritoneum forming the corresponding posterior false ligament of the bladder, and, reaching the side of that organ near the base, runs downward and forward in contact with it below the obliterated hypogastric artery, and is crossed upon its inner side, in the male, by the vas deferens, which passes down between the ureter and bladder. In the female, the ureters run along the sides of the cervix uteri and upper part of the vagina before reaching the bladder." Kelly,[24] who has perhaps done more than any one else to familiarize us with the ureter, calls our attention very distinctly to the relations of this organ to the ovarian artery and vein which cross it at about the middle of the abdominal portion and accompany it to the pelvis along its outer side. At the point where it dips down into the pelvis, especially on the right side, it is just behind the peritoneum, and can often be felt through the abdominal walls. However, on the left side at this level it is very apt to be behind the sigmoid flexure or its blood-vessels. It is again crossed in front by the ovarian vessels, and, still nearer the bladder, the uterine artery crosses inward above it. It passes completely under the broad ligament and along the anterior vaginal wall to the bladder. It can be very easily felt in the roof of the vagina in nearly all cases.

Physiology.—The function of the ureter is to convey the urine from the secreting organ, the kidney, to the reservoir, the bladder, and in doing so it is important that it be so arranged that there be no regurgitation of urine. The arrangement described by Bell would be sufficient for that purpose. Glantenay (p. 47) says, "At the junction of the ureter with the bladder the mucous membranes of these two organs form a circular fold that acts as a valve for the prevention of regurgitation of urine. This matter is of great importance in the after-treatment of uretero-ureteral anastomosis."

The urine is conveyed to the bladder along this canal by two forces usually, the one being absent when the subject assumes the horizontal position and the other constant. They are the force of gravity and the peristaltic movement of the duct. The former would be very readily understood from the position of the ureter, and the latter has been repeatedly noticed by physiologists as well as by abdominal surgeons. Smith,[48] during the removal of a very large abdominal tumor, had a most excellent opportunity to observe this action of the ureter. He saw the peristaltic action of this organ occur every four to six seconds in both ureters. Landois and Stirling [29] (p. 649) say that, according to the observations of Mulder, this motion passes along the whole length of the duct at the rate of twenty to thirty millimetres per second.

Literature.—The following cases of uretero-ureteral anastomosis are all we have been able to find in the literature of the subject, and they are arranged in as nearly chronological order as is possible, some operations not being dated. From the translations from the German we are pleased to acknowledge our indebtedness to Dr. R. H. von Ezdorf, of this city.

CASE I.—Franz Schopf,[44] *Cyst of Broad Ligament; Ovariotomy; Injury of the Ureter.*—S. F., thirty-nine years old, never pregnant, had a tumor occupying abdomen, filling pelvis, and very slightly movable. June 2, 1886, laparotomy, puncture of cyst, containing thin yellow fluid, pus-cells, fat, and cholesterine crystals; abdomen has very little serous fluid, one litre. Cyst adherent to broad ligament, uterus, and pelvic wall; bladder was freed from cyst; the adhesions were so thick that they were tied off and cut with the thermo-cautery; the right ureter was cut in separating these adhesions, and the two ends of it temporarily caught with forceps. The rest of the cyst was then removed with the use of Billroth's clamp. The ligamentous attachment was tied off in five portions and removed with the thermo-cautery. Attachments to the uterus were treated in the same manner; ends of ureters then considered; they were deeply buried in fibrous tissue, so that the ends could not be carried to the abdominal wound. It was therefore decided to sew the divided ends together, after proving they were patulous by the passage of a sound. They were dissected for a short distance free from the surrounding tissue, yet considerable remained on them. The ends were now freshened and approximated by eight silk sutures passed through all but the inner coat; no urine leaked, and the toilet of the peritoneum was completed; abdomen closed; operation lasted three hours; catheterized every four hours. June 10, has passed urine spontaneously, two litres per day. June 15, burning sensation in passing urine that is opaque and contains heavy sediment; bladder washed out with carbolic solution. June 30, patient has had diarrhœa, cough, and rapid loss of flesh. July 21, seven weeks after operation, died.

Autopsy.—Both apices of lungs surrounded by fibrous tissue; in left upper lobe several small abscesses; other parts of lung very anæmic; spleen decaying; right kidney size of a hen's egg; parenchyma contracted: pelvis of kidney distended; left kidney, amyloid degeneration; right ureter at crossing point of psoas embedded in connective tissue, itself like a linear cicatrix, with a fine, non-absorbable, silk thread; in bladder opaque urine and few phosphatic concretions on its walls.

CASE II.—K. Pawlik.[36] I. K. M., twenty-seven years old, IV-para, noticed enlargement of abdomen in fall of 1886, that has rapidly increased since March, 1887; small skeleton, poorly nourished, and cachectic; abdomen barrel-shaped; ascites; tumor extending across pelvis supposed to be malignant; lower extremities œdematous; twenty litres dark-brown fluid removed by tapping. November 4, 1887, exploratory laparotomy; pelvis found filled, tumor on right side, few cysts, and near it papillomatous growth; ascitic fluid drained by incision; thought to be a malignant growth; abdomen closed; discharged cured of wound December 2, 1887.

July 6, 1888, paracentesis, removing twenty-one litres of bloody serum; discharged six days later. March 12, 1889, patient feels generally improved. Removal of tumor was undertaken March 28, 1889, by abdominal incision; fourteen litres dirty yellow fluid containing cholesterine crystals escaped; peritoneum thickened; intraligamentous tumors; colpeurynter introduced into rectum cut peritoneal surface on left side; tissue beneath appeared as œdematous; shelled out the tumor-mass from below; attachments to the uterus tied and cut free; also tied outer side in region of inferior pelvic ligament; anterior surface of growth free, showing it to be attached to posterior layer of broad ligament. Right side: thick adhesion to rectum tied off and cut, freeing a peritoneal cyst; treated same as other side, thus freeing iliac vessels and a number of veins. This tumor was also adherent to posterior layer of broad ligament, but thicker and more strongly attached to peritoneum, bladder, and bottom of Douglas's cul-de-sac. After removal of the tumor began removing the papilloma in Douglas's space. This was difficult as the growth was deep in the cul-de-sac, and the colpeurynter raised it but little; carefully freed the mass; as it was so near the ureters a small portion of the adhesions had to be cut with scissors; in the peritoneal gap was a strand running from front posteriorly like a blood-vessel, with an opening that involved one-half the cut end of the strand, from which no blood escaped. Recognized as a ureter and passed an elastic ureteral catheter into the bladder, drew forward with forceps, passed the other end of it in the kidney end, and sewed the ureter ends over it with silk suture (Lembert) in two courses. After closing ureter closed peritoneum over it, also in other places where peritoneum was torn; closed abdominal wound; compression bandage; left ureter catheter in place; vesical tenesmus; bloody urine from catheter; catheter slipped out on account of patient's restlessness; died fourteen hours after operation.

Autopsy.—Abdomen contained a small amount of sanguinolent fluid; chronic peritonitis, perihepatitis, and perisplenitis; new fibrinous inflammation of intestinal serous membrane; the sutured ureter was patulous, and the sutures did not allow any fluid to pass even by injections under very strong pressure.

Cases III and IV.—William Tauffer.[50] (1) Enucleation right intraligamentous cyst; loosening and cutting of ureter. Placed in both ends of ureter a piece of English catheter, No. 8, tied in its middle; used six to eight sutures; removed catheter before tying last three knots; drainage, vaginal and glass abdominal; cured.

(2) Enucleation left extraperitoneal tumor bleeding; in excision and tying off parts of tumor capsule near the uterus, a tumor, bluish, transparent, one inch thick, thought to be a hæmatoma, was incised and found to be a ureter which he had cut off; sutured as first case; cured.

Case V.—Heinrich Fritsch,[16] on pp. 264 and 265 of his work, reports a case as follows: "In operating for a tumor, I once cut the ureter, and did not know whether I was dealing with that organ or a large vein. I passed a sound into the bladder and a ureteral sound into the lower part of the cut ureter; both sounds came into direct contact in the bladder, demonstrating that it was the ureter. With fine intestinal suture the ends were brought together and healed perfectly."

Case VI.—Julius Hochenegg.[20] Z. A., aged forty-eight years; cancer of body of uterus with infiltration of left parametrium, small vagina. February 9, 1890, sacro-peritoneal extirpation during which resection of left ureter and bladder was necessary. Ureter was sutured end to end and bladder sutured. On the twentieth day fatal hæmorrhage from the granulating wound occurred. Autopsy: Ureter and bladder sutures intact; origin of hæmorrhage could not be located even by autopsy.

Case VII.—H. A. Kelly.[25] During hysteromyomectomy, May 1, 1892, for the removal of a large tumor, he mistook the large ureter (hydro) for a large vein and, after ligating, cut it in two. Did uretero-ureteral anastomosis by ligating lower end close to cut surface, making a longitudinal slit one centimetre long in its anterior wall a half centimetre below ligature; invaginating upper end into lower portion and suturing the edges of the slit to the intussuscepted portion; iodoform-gauze drainage; patient passed urine on second day voluntarily; union by first intention; recovery.

Case VIII.—E. W. Cushing[9] reports a case of removal of a large soft myoma that had lifted up the ureters so that one of them was cut during the operation. The ends of the cut ureter were found and united by two fine sutures of silk and one of catgut. There was a discharge of a little urine from the wound for some two weeks, but the fistula promptly closed. Both ureters were distended and tortuous; recovery; patient well two years later (v. Emmet,[12a]).

Case IX.—B. Emmet,[12a] on November 22, 1894, while removing from a woman a large, solid mass attached over the fifth lumbar vertebra (œdematous fibroid, ten by twelve inches, pronounced by the pathologist of the hospital to have been at one time attached to the uterus), I chanced to sever the left ureter at that level. Anastomosed by the Van Hook method, using three sutures instead of one, as suggested by the originator, as the upper portion was very much distended and had to be puckered to get it into the lower portion. Then continuous suturing of the edges of the slit to upper segment. No drainage; catheter left in bladder six days; recovery.

Case X.—Doherty,[12] of Georgia, quoted by Van Hook, sent to the latter the report of a case like Kelly's in which he accidentally cut the ureter across during a laparotomy and immediately closed the injured duct by the Van Hook method. The patient recovered without an untoward symptom.

Case XI.—A. W. Mayo Robson[42] says, "In removing a large myoma uteri which weighed twenty-five pounds, and which had raised the peritoneum from the floor of the pelvis, I found I had taken two inches out of the ureter. Instead of performing a nephrectomy or establishing a ureteral fistula, I anastomosed the proximal into the distal end by splitting the lower end and drawing the upper into the lower; recovery; patient remains well six months after."

Case XII.—J. Wesley Bovée. Mrs. D., white, aged thirty-six years, married, was referred to me during the summer of 1895 by Dr. G. N. Perry, of Washington, D. C., for treatment of a much relaxed vaginal outlet. This was found to be present as well as a prolapsed uterus, the cervix of which protruded from the vulva; she bore evidence of the overwork that she said was necessary to the support of her child and her invalid husband. No disease of the appendages was present. At this time she accidentally received a blow in the right flank from a stone thrown by a boy. Surgical relief was advised for the relief of the pelvic condition. I did not see her again until April last, when, at the request of Dr. Perry, she was admitted to my service at the Columbia Hospital for the proposed surgery. She then told me she had continually suffered from pain at the seat of injury mentioned above.

Upon examination I was amazed to find the uterus fixed high to the left and front, that the right side of the pelvis was filled with an inflammatory exudate yielding a sense of fluctuation, and that a smaller mass was to the left and behind the uterus. Abdominal section was decided upon and done April 30, 1896.

A right tubo-ovarian abscess with a thick pedicle was found, and in ligating the ovarian vessels near the right side of the pelvic wall, the ureter, lying in a dense mass of exudate, was unintentionally included in the ligature. The outer end of the abscess mass was grasped by a strong forceps and the tissues between the ligature and this instrument divided with scissors. A vessel with a calibre larger than we would expect to find in such conditions, was found to have been severed in this procedure, the cut end showing in the end of the pedicle. The other cut end of the vessel was found, and, thinking the ureter had been severed, a uterine sound was gently passed along it to the bladder. Now, being certain of the nature of the duct, we dissected this portion of it from the abscess wall and bed of exudate and proceeded with the operation, taking advantage of this amount of time to decide upon the manner of treating the ureteral complication. This abscess was removed without rupture as was a large left pyosalpinx; the left ovary, though cystic, was left after being resected. It was decided to do an end-to-end anastomosis and by converting the transverse wound into an oblique one with some loss of extent of the duct. This seemed necessary as the lower end had been grasped too tightly by the forceps and the upper end by the ligature, tightly applied; both ends being damaged thereby. The side of the lower end grasped by the forceps was trimmed off with scissors quite obliquely and, after placing a gauze plaque about the upper portion of the injury, the ligature was removed and the ovarian vessels ligated. A very small amount of urine escaped from the cut ureter, confirming the diagnosis of cut ureter, and the sound was now passed upward to the kidney to interrogate the condition of the duct. This, though done very gently, brought a few drops of blood. Both kidneys were now palpated and thought to be larger than normal; nevertheless, as no other evidence of kidney or ureteral disease was found on the injured side, we proceeded to close the ureteral wound. The upper portion of the duct was cut off obliquely just above the place that had been constricted by the ligature and fitted to the lower stump already prepared for the union. The cut ends of the duct were dilated for an inch and approximated with No. 1 silk, such as is used in intestinal work, as follows: With a small, round, straight needle, a rectangular suture was inserted and tied, not very tightly; two interrupted ones followed, and this process of alternating was continued until the whole circumference of the duct had been sutured; the rectangular sutures were applied as in the liver or in some other friable tissue. Great care was necessary to procure an even and exact approximation of the surfaces without puckering, and this was done satisfactorily by the alternation of the two kinds of sutures.

Over these sutures were inserted a few, probably four or five, interrupted ones that reached a little farther up and down the duct: no suture penetrated the mucous membrane of the ureter. The peritoneum was carefully brought over the injured portion of the duct and sutured so as to wall off the ureter from the peritoneal cavity; the toilet was carefully made and the abdominal wall completely closed with buried kangaroo tendon in three tiers, all buried; bladder catherization was practised every six hours as necessary for the two following days. May 15, the patient has made an uninterrupted recovery; no suppuration has occurred in the abdominal wall and a very indistinct line of incision remains; patient left hospital about June 1. September 17, complains of pain in left side of pelvis; since operation has menstruated four times, once profusely, while on a railroad journey; three ounces of urine was drawn off by catheter and submitted to an analysist, whose report is as follows: Specific gravity, 1.016; reaction, acid; albumen, none; color, pale straw.

Microscopical,—a few epithelial cells, amorphous urates, phosphates; no pus, no casts from the kidney,—"epithelial cells probably from bladder."

An examination of the pelvic contents reveals a slightly enlarged uterus, a soft, freely movable mass two inches in diameter (probably a cyst of the remaining ovary) to the left of the uterus and slightly attached to it; some slight thickening felt, but little tenderness noticed, to the right of the uterus.

From September 17 to October 15, the urine was measured and varied in daily quantity from forty-one to ninety ounces. She has no periods of diminished excretion accompanied with pain that are followed by free discharge and sudden relief of suffering; is very nervous and has severe financial and family troubles. These latter probably cause the variable urinary excretion.

In the latter part of October a careful examination was made of the pelvic and abdominal organs to ascertain as nearly as possible their state and, especially, to learn if any ureteral or kidney changes could be found. The result was negative, except the small mass to the left of the uterus already alluded to, and that seemed unchanged since the examination of September 17; after some difficulty a sound was passed freely into the right ureter and no constriction seemed to be present.

Figs. 1 and 2 explain the method of trimming the ends of the cut ureter and of applying the sutures, as well as the appearance of the duct after suturing by oblique end-to-end anastomosis.

When this operation was done, we were not aware of any former one, nor of any like suggestion having been made for such cases. We had known of cases of cut ureter in which bladder anastomoses, rectal grafting, and even nephrectomy had been done. And we had heard of some in which the ureteral injury had been learned only by autopsy.

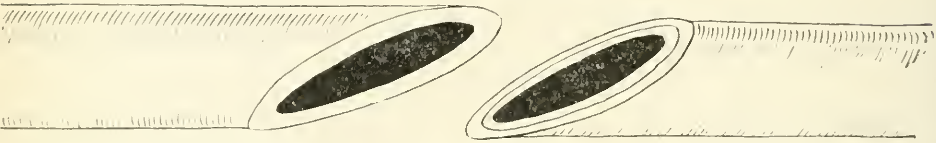

FIG. 1.—Shows obliquity of cut ends of ureter preparatory to oblique end-to-end anastomosis.

This was the first time an injury to a ureter had knowingly been a complication of any of the author's abdominal operations.

Since that time we have found in the literature of the subject mention made of twelve cases herein cited, of which one died in a few hours after an unusually severe operation (Pawlik), another on the twentieth day from secondary hæmorrhage (Hochenegg), and a third at the end of seven weeks (Schopf) from tuberculosis. In short, not one died from any ureteral complication. Of the twelve cases reported 25 per cent. died; seven were done in Europe and five in this country, Of the five

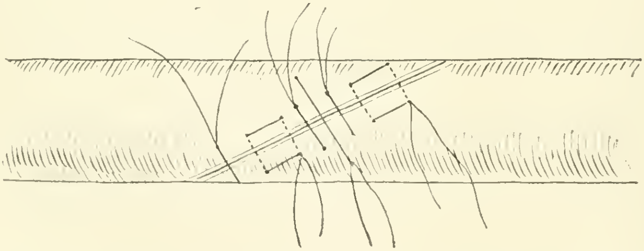

FIG. 2.—Shows oblique end-to-end anastomosis of ureter with sutures tied.

in this country all were saved, and of the seven in Europe three perished. The amount of shortening of the duct from resection was in Robson's case two inches, and in the author's fully one inch. In those of Kelly, Emmet, and Doherty an inch shortening probably occurred. As Van Hook has said, these ducts are very elastic and can be stretched considerably if necessary. Not much is to be learned from the published cases regarding the best method and suture material for this operation, as the description in case reports is very meagre. Schopf merely mentions using eight fine sutures that did not penetrate the mucosa ; Pawlik, two courses of fine silk, Lembert stitch ; Tauffer, silk, Lembert stitch ; Fritsch says, " fine intestinal suture," and Cushing, " two fine silk and one catgut." The author believes the rectangular suture with the interrupted is safest, and that fine silk is safer than catgut as it knots more firmly, not so long ends must be left and it occupies less space in the ureteral wall. Drainage is mentioned in but four cases, those of Kelly, Tauffer, and Cushing, and in but one, Cushing's, was there any leakage reported.

The operation of itself is not an easy one. In nearly all cases the duct cannot be brought up to the abdominal wound for repair, and, therefore, it has to be done deep in the pelvis or in a higher portion of the duct. If we have been dealing with a large accumulation of pus in the pelvic cavity, or, as in many of the cases reported, with large abdominal and pelvic tumors, we probably have severely taxed the recuperative powers of the patient, and are anxious to close the wound and get her in bed. Then, too, our fingers are tired, and we do not feel like attempting a task so delicate as this one is when properly done. Is it, then, surprising that some alternative that can be more easily done, is resorted to instead?

While the normal urine is not injurious to the peritoneum, yet it is advisable to prevent its coming in contact with it, if possible. We cannot be certain that it is not infected, as will be the case, if a suppurating focus from stone or other cause be present higher in the canal. It is well, therefore, to apply forceps to the upper end of the injured duct, or gauze between it and the peritoneum, until after the suturing is finished. If the pressure forceps be lightly applied, the injury to the ureteral wall will be slight and quickly repaired by the wonderfully good blood-supply with which this organ is endowed. Should we be so unfortunate as to come in contact with pus in the operation, it will be necessary to establish drainage, otherwise its use is scarcely demanded. I do not wish to be understood as ignoring the presence of ureteral abnormalities above or below the point of suturing, but to particularly guard against temporary infection from them. It is advisable to explore the duct for these conditions before closing the wound in its walls. It is not in the purpose of this paper to discuss the various lesions already mentioned that call for this operation as nearly always it will be supplementary to other surgical procedures, and its success depends upon the care, skill, and anatomical knowledge of the surgeon. Before entering into the consideration of the various methods of restoring the passage of the duct, it will be well to mention some of the experimental work in this line that has been done on dogs.

Weller Van Hook,[21] of Chicago, devised and practised on a dog as follows :

January 17, 1893. Bitch, medium sized, in good condition. Assisted by Dr. A. E. Halstead, opened the abdomen in the median line through an extent of two and a half inches, beginning at a point one inch above the pubes. Gentle traction upon the bladder caused the ureters to stand out prominently beneath the posterior layer of the peritoneum. Opening the posterior peritoneal wall with a snip of the scissors, the right ureter was drawn gently out and cut in two with the scissors, at a point about an inch above the entrance into the bladder. The open end of the lower fragment was next closed with a ligature and a slit about seven millimetres long made in the side of the tube just below the ligature. Two needles, armed with a single thread of catgut, were then passed through the wall of the upper portion of the duct from within outward, opposite the slit in its wall which had been made to enlarge the opening. These needles were then passed through the slit in the side of the lower portion of the ureter and their points carried down the tube about one centimetre, where they are pushed through the wall of the ureter and brought out side by side. By gentle manipulation the upper extremity was drawn into the lower tube, and the suture being tightened and tied, the slit was seen to be entirely occluded. Dogs have a very abundant omentum, and to simplify the technique the omentum was gently drawn about the ureter and tacked down by two fine silk sutures. The abdomen was closed. Three weeks later the dog, which had not been ill after recovering from the anæsthetic, was killed. Abdominal wound was completely healed. Upon opening the abdominal cavity much fat was found in the usual places, showing good nutrition. The kidneys were perfectly normal and exactly equal in size and similar in appearance. There was no excess of urine in either pelvis. There was absolutely no evidence of inflammation at any point. The union of the ureter was found to be perfect.

According to Glantenay, p. 221, Poggi, of Italy, in 1887 tried anastomosis of the ureters in two dogs by invaginating the upper segment into the lower and suturing them in place. The results were eminently successful. In one dog this was carried out in both ureters. Both dogs recovered without leakage about the site of operation, though the lumbar wound had been closed completely. One dog was killed at the end of fifteen days and the other in three and a half months. The continuity of the ducts had been entirely re-established without the slightest restriction. Tuffier was not so successful, due to the tendency of the upper end to slip out of the lower as soon as peristaltic action was established and to obliteration of the duct in other cases. Budinger,[6] assistant to the clinic of Billroth, made several experiments, following the method of Poggi, with very bad results. Much fault may be found with the procedure of both these latter workers. They tied the ducts before operation and untied them afterwards, thus injuring them and encouraging both restrictions and fistulæ. The failure was in part due, also, to the small size of the ureter in the dog. Bloodgood[25] performed the operation on a large dog, following Van Hook's method, killed the animal at the end of two and a half months and found no restriction of the calibre of the ureter.

Methods.—From the above it will be noticed that efforts to unite the ends of the ureter have been done by four methods,—viz. (1) *lateral implantation* by the method of Van Hook, a very ingenious procedure, and which has been done by two experimenters, and on man by three operators, all in this country and all successful; (2) by *transverse end-to-end* approximation practised on the living seven times probably with good results; (3) by *oblique end-to-end* anastomosis,—only one case, the author's, which was successful; and (4) the *end-in-end* method, as applied in experimentation on dogs with varying success by foreign experimenters, and in one case on man,—Robson's,—which was also successful. Of the Van Hook method we make but one criticism. The sutures pass through the mucous membrane of the upper end in two places and between these places is in the lumen of the duct. In our judgment this offers an opportunity for the urine to percolate through the wall of the tube along the sutures. Of the transverse end-to-end method the results have been very good. Schopf's patient probably died of tuberculosis, and had a contracted or atrophied kidney and dilated pelvis on the side of the injured ureter. As the duct had been in a mass of dense fibrous tissue previously, and as all adhesions, even the ureter itself, had been severed by the thermo-cautery, it is not surprising that the autopsy showed this condition with other changes. In Pawlik's case death occurred too early to demonstrate anything beyond the complete closure of the wound in the ureteral wall. This was demonstrated beyond any doubt. Tauffer's two cases are reported as "successful," without any description of the meaning of that term. Hochenegg's case died of secondary hæmorrhage from the wound of sacral hysterectomy on the twentieth day, and the autopsy showed perfect healing of the ureter; nothing more being recorded bearing on the amount of constriction. Fritsch merely says his case healed perfectly, and that is all that can be gotten from the brief report of the case of Cushing. In this last case, however, perhaps due to incomplete suturing, there was a leakage for two weeks. The end-in-end plan, as followed by Robson, we cannot endorse without reserve. The failure of some experimenters leads us to look upon it with suspicion. We must not forget, however, the successes of Poggi and Robson and the difficulty of dealing with this duct in the animals experimented on due to its small size, as attested by Van Hook himself, a bitter opponent of this method. We look forward to better results from experimentation by this plan. Of the oblique method, perhaps, we should speak with reserve, as it is the only plan that has been followed by us, and the case herein mentioned is the only reported application of it to man or the lower animals. By it, however, the objections to all plans, other than Van Hook's, are obviated. The line of union is much longer than in the transverse union, the ends do not separate, as is their tendency in the invaginated method of Poggi, and the constriction cannot well be of moment. We believe it is as worthy of merit as Van Hook's plan. Certainly no suture penetrates the mucosa as in his method, a fact that would seem to us of no little importance, especially if permanent suture material be employed in the procedure. The literature of the subject of ureteral calculi is not free from case-reports of calculi formed with ureteral sutures as a nucleus.

The *alternatives* for this operation may be divided into two principal classes,—viz., those having in view the *restitutio ad integrum* of the ureter, and those planned for the complete extinction of the urinary function of the affected side. In the first variety may be classed implantation into the bladder, rectum, ascending or descending colon, small intestine, vagina and its grafting on to the skin. In the second class we may place nephrectomy and simple ligation of the ureter, as is done to produce atrophy of the kidney, with complete loss of its function.

The bladder graft is probably the best alternative we have for uretero-ureteral anastomosis. Though not as good an operation, it is applicable to wounds of this duct too extensive for the approximation of the cut ends of the ureter. It has been successfully practised by Krug,[27] Penrose,[37] Kelly, and many others after the method suggested by Van Hook, and by Novaro,[34] and others using the Paoli-Busachi method. The plan suggested by Van Hook of making a canal of part of the wall of the bladder, outside of the peritoneum, when necessary to meet a short portion of the renal end of the ureter, is a brilliant project and worthy of trial. He even suggests the downward transplantation of the junction of the peritoneum to the bladder when necessary to get a still longer bladder flap. It allows for a great loss of ureteral structure, and, if it proves successful, we will have little to desire further in the restorative surgery of this duct. All these cases and very many others have been done by the intraperitoneal method, and we have been able to find but one case performed extraperitoneally (Baumann[2]).

The extraperitoneal route, however, is much inferior to the vaginal or the intraperitoneal way. Implantation into the rectum of one or both ureters was first suggested by Roux and put into practice by John Simon, in a case of exstrophy of the bladder with an unfavorable result. Chaput has done it twice successfully, and Leet,[30] of Scranton, Pa., has performed it with like result. Reed, Zeller, Van Hook, and others have experimented on animals, reaching different conclusions. Van Hook has concluded that the danger of infection is so great that it is an unjustifiable procedure. Boari,[4] an enthusiast on this subject, resents the statements of its opponents regarding this danger of kidney infection, and, in the paper in which he describes his buttons for this anastomosis, says, "Quant à moi, je suis convaincu que le courant de l'humeur sécrétée par une organe, *quand elle a un libre cours*, est capable de maintenir intact le canal excréteur et de le défendre des agents infectants qui pourraient s'y introduire du dehors." He further says that the gradual trickling of the urine prevents infection. These and other statements made by him—that the uterus has an opening on the surface; that a child mentioned by Duplay and Reclus lived seventeen years, voiding all urine by the anus, and that recto-vesical and vesico-vaginal fistulæ exist indefinitely without infection—are of no value, and we must agree with Van Hook that great danger of infection of the kidney is always present in cases of ureteral implantation into the rectum, as well as into the colon or small intestine. It is probably the absence of the valve-like mechanism that normally exists at the vesical end of the ureter that allows such facility to infection of the urinary tract. The power with which some duct-lining cells seemed to be endowed, that of defending the organs to which they act as carriers, from infection, is not given to the otherwise potent cells that line the ureter. Here nature has placed three organs of defence,—viz., the muscle that guards against incontinence, ordinarily, the *sphincter vesicæ;* the mechanism described by Bell, previously mentioned, and the mucous fold at the ureteral orifice together with the obliquity of the vesical portion of ureter. It is easily understood that in nearly all cases of ureteral grafting the two latter defences are destroyed, the only exception being when a portion of the bladder wall surrounding the duct orifice is transplanted with the duct. This is done in some cases of grafting into the rectum. Even then the musculature of Bell is not retained.

Experimenters have attempted to form a valve at this point to obviate the danger of future infection. Practically the same arguments hold against grafting the duct into the intestinal canal at other points. There yet remains one class of cases, however, in which this mode of disposition of the excretion of urine is the only one. I allude to cases of incurable bladder-disease, particularly when malignant or tubercular, in which it is necessary to remove that organ. In such cases we can sometimes save the ureteral orifice on one or both sides and implant it into the rectum. The difficult feature with grafts into the bladder, as well as of those into the bowel, is to secure anastomosis that will take the place of the natural one that exists at the termination of the ureter in the bladder. Boari thinks this sphincter of paramount importance. There seems, on the one hand, to be danger of too great constriction, producing an impediment to the passage of the urine and a consequent hydronephrosis, and on the other, a too large opening with free regurgitation of urine, especially when the bladder has been allowed to become even slightly distended, with the same evil result. In these bladder anastomoses we have also the danger of regurgitation whenever contractions of that organ occur. There will be less resistance in the direction of the graft than by the sphincter vesicæ. A. James[23] has demonstrated that a head of water of 2.4 feet causes sufficient pressure on the tubules of the kidney to completely suppress the function of the organ. That this condition may easily result from backing up of urine in the ureter and pelvis of the kidney is readily understood. Tauffer[50] and Schramm[45] have devised plastic methods for conversion of uretero-vaginal fistulæ into bladder grafts. They are done in the vaginal roof. The desirability of such work is apparent, as many cases are reported in which fistulæ have resulted in kidney infection.

Boldt[5] says that in a case of uretero-vaginal fistula the kidney became infected, and he was obliged to resort to nephrectomy, which saved his patient. This case again shows the importance of some barrier against infection at the orifice of the ureter and supports Boari's[1] suggestion as to the value of the sphincter. Grafting the ureter to the skin is scarcely more satisfactory than rectal implantation. It may, however, be done as an expedient preparatory to the establishment of a new urinary passage to the bladder as recommended by Rydygier.[43] His plan is to make a channel of the skin, and, joining it to the two ureteral ends, complete the canal from kidney to bladder. Implantation to the skin may be applied in cases of anuria when due to compression of the ureter from some inoperable tumor. Under such conditions infection of the urine and kidney could be prevented for a short time, at least, by antiseptic dressings. This would be very tedious if carried out for an indefinite period. Le Dentu was the first to successfully practise this form of ureteral grafting, in a case of cancer of the uterus, though the woman died a short time afterwards. Implantation of the ureter into the urethra, proposed by Gluck and Zeller, was successfully practised on a man by Nichaus in one case (Boari, p. 7). Adolfo Schwarz[46] succeeded in removing the bladder in dogs and grafting the ducts as mentioned. At first the incontinence of urine was almost constant, but after a few days it improved materially, and in a few weeks was nearly absent. A well-defined bladder had been formed from the urethra, and even a sphincter vesicæ from its muscles. This was in the female. It is a question of whether vaginal grafting of an injured ureter, when possible, is not better than attaching it to the skin or the bowel, particularly if bladder grafting is later done. It is scarcely worth mentioning that an open wound for simple drainage of urine, without attempting to suture the ureter, may be made. Yet our patient may be in a condition that will not permit sufficient delay for the repair or implantation of the injured structure. Then such a procedure might be justifiable.

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[1] Loc. cit.

Of the methods employed for the destruction of the urinary function of the injured side we have two ways of procedure: simple ligation of the ureter to produce a backing up of urine, and consequent cessation of the kidney function, and nephrectomy. The latter is far inferior to any of the forms of grafting employed, and even to simple ligation of the ureter. This latter procedure is extremely easy, and if the urine is known to be sterile then it is applicable in some rare cases. This results in backing up the urine excreted, distending the ureter, then the pelvis of the kidney, and, later, the uriniferous tubules of the kidney until the pressure of the blood is equalled or, possibly, exceeded by that of the urine. In this manner is produced arrest of kidney function, as shown by James's experiments. If we do happen to infect the duct during the operation, or if it be infected previously, then the danger is extreme. Even if this contingency be absent, we cannot be sure that other complications which readily suggest themselves to us may not arise. In all cases of destruction of the kidney function we should be sure there is a kidney on the opposite side and that it is functionating well. Even then it is a very dangerous procedure. A quite important point in ureteral grafting is the ligation of the lower portion of the duct. This is not always necessary, but a number of cases have been reported in which, after the kidney and a considerable of the corresponding ureter have been removed, urine has continued to come from the wound, and later been found to be passing from the bladder through the cut ureter. Modlinsky[32] and Pozzi[40] report cases of this kind. It would seem a loss of time to mention nephrectomy for such ureteral injuries as come within the limits of this paper, but the frequent reports of nephrectomy under such circumstances are altogether too common to permit us not to warn against this operation except when no other plan can be followed. This method of treatment is applicable to transverse section of the ureter, whether complete or partial (except very slight wounds), as follows:

(*a*) Accidental wounds during surgical operations.

(*b*) Ruptures and injuries from external violence.

(*c*) Exsection of not more than three inches for malignant or benign growths, and

(*d*) For obliteration of the duct by inflammation, compression, or other cause, not to exceed three inches, accompanied by ureteral fistula, or otherwise.

(*e*) Necrosis from contact with calculi to such an extent that posterior drainage would not prevent a very considerable narrowing of the calibre at the point of injury, and

(*f*) In nearly all cases in which leakage from the ureter into the abdominal cavity occurs.

This method of repair of the ureter is applicable even if a considerable portion of the duct be removed. If we loosen the organ from its attachments a few inches above and below the seat of injury, and make steady, careful, and light traction upon both extremities, the amount of apparent surplus of its length will soon be perceived. Robson cut out two inches of the duct and successfully did an end-in-end anastomosis which required about another inch of it. In the writer's case at least an inch was removed, and it was noticed at the time that considerable more of the tube could have been spared and yet the approximation been made. The use of the ureteral catheter during the operation, as practised by Tauffer in his two cases, or of using it during the operation and leaving it for drainage afterwards, as Pawlik did, seems to the writer of no benefit, even if it be not harmful. In the case of the last mentioned surgeon it slipped out owing to the restlessness of the patient. As the patient had been subjected to a very severe operation, from which she died, we are not justified in attributing the restlessness to the presence of the catheter. Yet we must agree that the presence of a foreign body in the ureter already badly injured must annoy a patient to no little extent.

Anomalies.—It is well to bear in mind that anomalies of the ureter frequently occur, and, if possible, to take advantage of them when placed in the unfortunate position of having an injured ureter to deal with. Arden-Deltiel, of Montpellier,[1] and Smith[48] record cases of two complete and entirely separate ureters on one side, and cases of double ureters of one side coalescing just before entering the bladder have been reported by Wood,[54] Porter,[39] and others. Indeed, this latter condition seems to be very frequent. Others have reported cases of double complete ureters on both sides. Anomalies are so common that we should bear it in mind, as in such event we may find it unnecessary to resort to the delicate surgical work of repairing a cut ureter. Ofttimes they are divided above or below, and the repair may resolve itself into the ligation rather than the repair of a cut ureter.

After-Treatment.—As mentioned elsewhere, drainage may or may not be necessary, according to the presence or absence of pus in or about the cut ureter. Should there be a history of syphilis, tuberculosis, or other condition of the patient causing suspicion that the healing of the wound would not be prompt, drainage would also be advisable. *Per contra*, if the wound in the duct be nicely approximated and there be no other condition to indicate it, drainage will be unnecessary. So many cases of back-flowing of urine have been reported from antiperistalsis or other cause that we should do our best to assist the escape of urine from the bladder by the urethra. This may be done by frequent catheterization for the first two or three days, or even by leaving a bladder catheter in place for the same length of time. Since the danger of infection (of at least the bladder) is greater by the latter plan, it is probably less advisable. During the first few days the urine should be measured. Very frequently after abdominal operations the quantity of urine excreted is much diminished for a few days, and even suppression may occur. This consideration renders less valuable its measurement. But if a fairly normal amount be excreted, we feel that not much trouble is present in the urinary tract.

Results.—As previously mentioned in this paper, but three cases have been reported that have been done by the Van Hook method; all recovered, but no positive statement is made as to whether subsequent constriction or its consequences occurred in either of them.

Van Hook and Bloodgood have reported no constrictions in the dogs they operated upon, one three weeks and the other two and a half months after operation. These reports show pretty certainly that the results of this method are good. Of the experiments of Poggi, using the end-in-end method, it is said they are absolutely successful. In one dog the anastomosis was done with both ureters, and in both dogs recovery occurred without leakage of urine and without the slightest constriction of the duct. These dogs were killed fifteen days and three and a half months after operation. Budinger and Tuffier had deplorable results from their experiments by this method. It is but fair to presume their technique was faulty. Robson's, the only case done on man by this method, is briefly reported as successful. He also gives no subsequent history. Seven cases have been done by the transverse end-to-end approximation, and so far as leakage goes all were successful. One of them died too early to furnish us with any information as to constriction. Another died in twenty days, and the report of the autopsy gives us no light on that subject. A third case died of tuberculosis at the end of seven weeks, and at the autopsy were found a dilated bassinet and contracted kidney on the affected side, as well as incarceration in dense fibrous tissue of the ureter at the point of injury. There was also amyloid degeneration of the left kidney. It is hardly proper to consider this case at all in this connection, as the condition of the patient during the process of repair and of the probability of tuberculosis having at least assisted in the destructive work at the seat of injury to the ureter. Besides, the ureter and adhesions were severed with the thermo-cautery, which undoubtedly produced great cicatricial contractions even in the ureter itself. Aside from these three cases, four successful ones are reported. Of these, not one furnishes us with any intelligence on the late conditions of the duct. However, as they were all reported some months after operation, they may be considered practically as having had no subsequent trouble. Of the oblique end-to-end anastomosis of the ureters the writer has not been able to learn of any experiments being done on lower animals, and his case is the only one in which the method is known to have been employed. The result is certainly as good as in any other case ever reported, and there seems to be no reason why it is not as applicable, as good in theory, as easy in execution, and as certain in its happy results as any method thus far devised. The objection of Van Hook to all methods of uretero-ureteral anastomosis other than his own is apparently based upon the unsuccessful experiments of Tuffier, Budinger, and a few others upon the dog, whose ureter is known to be a very small, delicate tube, and possibly Schopf's case.

We feel that we must dissent from the fourteenth conclusion of his admirable paper on ureteral surgery, which is, " In complete transverse injuries of the ureter in continuity, union must not be attempted by suture." In the cases herein reported, with the possible exception of that of Schopf, we see positively no evidence of the slightest evil effects of suturing complete transverse injuries of the ureter.

CONCLUSIONS.

(1) Uretero-ureteral anastomosis is a perfectly feasible procedure.

(2) Uretero-ureteral anastomosis, whenever possible, is far preferable to any other form of ureteral grafting, to nephrectomy, and to ligation of the ureter.

(3) It should be done preferably by lateral implantation or by oblique end-to-end anastomosis, though the transverse end-to-end or the end-in-end methods may be safely employed.

(4) That constrictions of the calibre of the ureter do not usually follow attempts at suturing in closure of complete transverse section of the duct.

(5) That nephrectomy for transverse injuries of the ureter, *per se*, is an unjustifiable operation.

(6) That simple ligation of the ureter to produce extinction

of the function of the kidney is too uncertain to justify its practice.

(7) That drainage is not necessary if the wound be perfectly closed and the tissues throughout are aseptic.

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CONTRIBUTION TO THE HISTORY OF OPERATIVE INTERFERENCE FOR THE RELIEF OF OBSTRUCTION OF THE COMMON CHOLEDOCH DUCT BY BILIARY CALCULI.[1]

By HENRY O. MARCY, M.D.,

OF BOSTON.

IN 1876, it was my fortune to care for one of the most intelligent of physicians who was suffering with an intermittent form of biliary obstruction, resulting, as he believed, from a calculus.

He often discussed the feasibility of surgical relief, and emphasis was made upon the belief that measures should be devised by which the foreign body could be safely removed.

In fulfilment of a promise made him, I examined the body after death, and have now in my possession the obstructing calculus.

The clinical history of the patient is of practical interest. The suffering was intermittent, at times there was a marked icterus, followed by periods of comparative relief. He occasionally had bloody vomiting and much of his suffering was referable to the digestive tract. The immediate cause of death was hæmorrhage from the stomach, and there were a number of lesions in the mucous membrane of this organ as also a marked stenosis of the duodenum, caused by cicatricial contraction. It was believed that these pathological conditions were dependent upon secondary changes incident to icterus-poisoning, since only at the periods of biliary obstruction did he have marked attacks of continued nausea and vomiting.

In 1880, another intimate friend suffered at times severely from biliary obstruction, and often declared that she could determine with precision the location of the something that caused the attacks, and determine with considerable accuracy the dislodgement of this something, followed by speedy relief. These attacks became more frequent and severe, when the subject of surgical interference was discussed with the late Dr. C. Ellis, of Boston, one of the wisest of clinical teachers. The gall-bladder was not especially enlarged, and the obstruction was believed to be in the common duct, almost without question a calculus, but operation was decided adversely, since surgical exploration of the common duct was believed at that time impossible. Later the autopsy showed that the diagnosis was correct, and a careful anatomical study of the conditions found taught me to believe that a surgical operation might have been performed, the offending calculus removed, and the parts closed with a reasonable expectation of recovery. Here, as in the first case, the icteric condition was intermittent for a period of some years, and when relief from the obstructive conditions was obtained, the patient would remain for several months in a condition of health, nutrition good, and general vigor not impaired.

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[1] Read before the New York State Medical Association, October, 1896.

Post-mortem conditions were instructive in that the gall-bladder was small, contracted, the hepatic structures not particularly changed, the obstruction was caused by a gall-stone, measuring one-third of an inch in diameter, lying in the common duct.

The stone was movable, the mucosa of the duct was eroded with slightly bleeding walls, apparently caused by recent pressure. There had evidently been considerable play of movement in the dilated duct, perhaps explaining in a measure the intermittent symptoms of biliary obstruction. The fatal attack lasted some days, and, as in the first case, the nausea and vomiting were persistent, and towards the end a very considerable quantity of fresh blood in the vomitus was believed to have hastened the fatal issue. Towards the pyloric orifice the mucous membrane was broken with several small bleeding vessels.

In 1881 a second case came under my observation, a woman in middle life, previously in excellent health, was suddenly seized with seeming complete biliary obstruction, with forecasting of a probable fatal issue. Repeated consultations were held, in which surgical interference was discussed with her former physician, Dr. Z. Adams, of Framingham, and the late Drs. Ellis and Bowditch, of Boston. The probable diagnosis was accepted of biliary obstruction of the common duct by a calculus, with the possibility of malignant disease. I advised an exploratory incision, which was warmly supported by Dr. Bowditch, but was as strenuously objected to by Drs. Adams and Ellis. An adverse decision was rendered by the friends after intelligently inquiring as to the history of such operations, especially when I informed them that to the best of my knowledge the surgical relief of biliary obstruction in the common duct had never been attempted by surgeons. An autopsy, about two weeks later, showed a gall-stone impacted in the common duct with a disorganized liver as the cause of death.

A careful study of the conditions confirmed my conclusions, arrived at in the former case, that it would have been practicable to have removed the calculus, with a fair prospect of subsequent recovery.

I then determined that such experience should find fruitage in definite action.

Dr. W., of Vermont, aged seventy-two years, a physician of exceptional intelligence, had suffered for a number of years with more or less severe attacks of biliary colic, which he thought due to the obstruction of the common duct by a gall-stone. Through his thin relaxed abdominal wall he believed at times he could differentiate a foreign body, which was movable and which often acted as a valvular wedge, causing obstruction of the common duct. When these attacks came on the gall-bladder would become distended as a small, tense, painful tumor, followed by jaundice which, after a time, would subside with a retrocession of the obstructing mass, and a relief of his biliary suffering. The last attack, occurring in July, 1887, continued much longer than usual, and the doctor himself believed it must result fatally unless in some way speedy relief could be given. As a consequence I was summoned. The patient had been unable to sit up for some days, vomiting more or less constant, emaciation extreme, the patient evidently in immediate danger. There was much pain and tenderness at the base of the liver, and just to the right of the median line there could be felt a small ill-defined mass which the doctor emphasized as the location of his obstruction. An incision was made parallel to the lower rib; the base of the liver was easily found and a rather small undistended gall-bladder was exposed, which was intimately bound to the transverse colon by old firm vascular adhesions. The incision was extended towards the median line, but adhesions were everywhere encountered, and a further dissection was reluctantly abandoned. A small calculus could be felt in the common duct, which was dislodged by the finger and pushed upward into the gall-bladder. It could have been removed through an incision made into the gall-bladder and the wound closed, but it had not then occurred to me to do this by means of buried sutures, and the adhesions of the gall-bladder to the parts about rendered it impossible to attach an opening made in it to the parietal peritoneum for drainage. I therefore reluctantly abandoned further effort for its removal and closed the wound without drainage. Immediate recovery followed with primary union and marked relief of his obstructive symptoms. However, after a period these returned with all their former severity, soon followed by death.

A careful autopsy was made by the late Professor Frost, of Hanover, who reported that a calculus, about the size of a walnut, was in the greatly dilated common duct, producing complete occlusion. Although the hepatic structure was not materially changed, yet the old adhesions, binding the gall-bladder to the transverse colon, were so extensive that the post-mortem dissection was made with difficulty, and on this account further operative measures would have been, in his judgment, unjustifiable.

A fifth case came under my observation in 1889. The patient, Mrs. P., aged forty years, had had several attacks of biliary colic of a serious character, accompanied with jaundice. The last attack preceding the operation occurred in August, 1889. Life at that time was thought imperilled and she had not been quite well since, up to the time that she entered my private hospital, she was suffering from severe local pains, some vomiting, and marked jaundice with dark urine, and clay-colored stools. She had a thick abdominal wall, beneath which a considerable sized fluctuating tumor could be well defined, the base of which was quite on the line with the umbilicus.

Operation October 26, 1889, assisted by Drs. Clark and Nelson. Immediately upon dividing the peritoneum, the cystic growth distended the lips of the wound. It was attached to the peritoneum by a double row of tendon sutures and incised. Ten ounces of thin, light-colored bile escaped, floating out with it a gall-stone the size of a large almond. Since it was apparent that biliary obstruction could not result from a large stone floating in a dilated gall-bladder, further operative measures were necessitated. Careful probing revealed the presence of another calculus, situated deeply towards the median line quite beyond the cystic duct. A free flow of bile continued through the opening in the gall-bladder, showing that the hepatic duct was not occluded. All effort at dislodgement failed, and as much force as was deemed justifiable was used in the attempt to crush it by pressure upon the walls of the duct, but without avail. With long, slender forceps I could obtain an imperfect hold upon the calculus, and with the blunt uterine curette partially rotate it. The bladder was washed out with a sublimate solution, the stitches cut away, the wound packed with sponges after having somewhat forcibly drawn the gall-bladder through it. Even this procedure did not enable us to seize and remove the calculus. I then divided the walls of the common duct with scissors, and everted its edges from over the roughened calculus, which was even then removed with difficulty. Further probing not alone demonstrated that there were no more calculi, but after delicate manipulation the probe passed easily some inches beyond into the intestine.

It now became a question of importance how to close this long, deep opening. The abdominal cavity had been shut off by sponge-packing and fortunately kept entirely clean. The operative field was much more accessible than had been deemed possible. The incision in the abdominal wall had been extended nearly to the median line, about five inches in length ; the dilated duct was quite the size of the little finger, its walls much thickened.

With a full-curved needle and a carefully-selected tendon suture, I united the divided edges of the thickened mucous membrane of the duct and gall-bladder by a continuous suture. This was followed by another layer of continuous sutures carefully coaptating the peritoneal edges, while over all a third layer of tendon sutures was applied, the stitches taken parallel to the long axis of the wound through the peritoneum about three lines from the cut edges, each succeeding stitch entering exactly opposite to the emergence of the preceding one. Tension upon this suture not alone buried it, but also intrafolded the uninjured peritoneum with exact coaptation. The wound through the duct and gall-bladder thus closed measured four inches. The sponge packing was now removed and a careful examination showed that the contiguous deeper structures were uninjured. The peritoneum was closed with a continuous double-tendon suture and the sundered muscular structures similarly closed in separate layers. The skin was also coaptated by a layer of buried tendon sutures and the wound sealed with iodoform collodion. Rapid convalescence ensued without incident. The rough mulberry-looking calculus, grape-size, which was removed, weighed, when dried, fifty-nine grains.

Of course, this method of closure does not permit of drainage. It is the method, however, which I have advocated and practised for the closure of all aseptic abdominal wounds for many years.

These preceding histories were much more briefly reported and published in a contribution entitled, "Surgical Relief of Biliary Obstruction."[1] I now believe, as I then supposed, that I was the first to operate for the removal of a calculus situate in the common duct.

I have reported these cases with greater accuracy of detail, since Dr. Christian Fenger, in his valuable contribution entitled, "Stones in the Common Duct, and their Surgical Treatment,"[2] states that, "Courvoisier was the first to perform choledocholithotomy. He had made the diagnosis of choledochus stone and planned the operation beforehand. His first operation was performed January 22, 1890."

Since the date of my publication, in 1890, I have operated a number of times, and give my fullest approval to the advisability of surgical relief of biliary obstruction in properly selected cases.

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[1] Read before the Surgical Section of the American Medical Association at Nashville, May, 1890.

[2] American Journal of the Medical Sciences, 1896.

A FURTHER CASE OF PRIMARY TUBERCULOSIS OF THE BREAST.

By CHARLES A. POWERS, M.D.,

OF DENVER.

IN May, 1894, I reported to the New York Surgical Society a case of tuberculosis of the breast which had been under my observation some years before. At that time a thorough search through medical literature revealed but thirty-three additional cases in which this lesion had been confirmed by histological examination. Since the publication of this paper,[1] I have been able to find but four additional instances,[2] and the rarity of the condition lends interest to the publication of the following case which has recently been under my care.

Mrs. D., forty years, referred to me in December, 1895, by Dr. P. V. Carlin. The patient is the mother of six children; she had a "caked" breast on the right side when nursing the second child ten years ago, and has never since nursed with the right breast. Two months ago she noticed a hard mass in the right mamma, this was at that time irregular in shape and about the size of a small apple. It was slightly tender. It has slowly but steadily increased in size.

Two of the patient's sisters and one brother died of pulmonary tuberculosis, the patient herself has had no symptoms of pulmonary disease.

Examination reveals a firm, irregular, diffused mass in the upper inner half of the right breast; the skin over it is normal, the mass is not tender, it seems fixed to the pectoralis major, but moves on the chest wall at a right angle with the fibres of this muscle. The nipple is moderately retracted ; no enlarged glands are to be felt in the axilla or in the supraclavicular space.

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[1] ANNALS OF SURGERY, August, 1894.

[2] Gaudier et Péraire, Revue de Chirurgie, 1895, p. 768. Recnick, Beiträge zur klinische Chirurgie, Bd. XIII, Heft 1.

Diagnosis of cancer of the breast was made and immediate operation advised. This was done on December 13, 1895. An incision into the mass revealed a cyst with ragged walls, irregular in its outline, diffused through the upper inner half of the gland, and containing a thin cheesy pus. The process extended to the surface of the pectoralis major muscle. At the time of the operation the thought of tuberculosis came to me, but I was by no means certain that the condition was more than a chronic mastitis. The diseased portion of the breast together with the outer layer of the pectoralis major was excised in wide limits, and the wound sewn up with a small drain at its lower angle. The drain was removed on the third day and the wound healed throughout by primary union. Dr. H. C. Crouch to whom was sent the material for histological examination reported it to be typical tubercular tissue.

I have seen the patient from time to time since ; there has been no recurrence.

This case well illustrates the importance of a microscopic examination of uncertain tumors at the time of operation. This is a method which has served me admirably in numerous instances, and had I had the pathologist on the ground at the time of operation, and had he reported the tissue to be tubercular, I should have explored the axilla and removed its contents, for we know that in tuberculosis of the breast the axillary glands may be involved early and should always be removed. The management should be practically that of cancer, though we will be safe in sparing the muscles. In the foregoing case the symptoms were those of cancer, the error in diagnosis being revealed by the incision.

The origin of primary mammary tuberculosis is doubtless metastatic infection from tuberculous lymph-glands. Direct infection from without, by way of the nipple, is hardly probable, and we are not to forget that these cases are not to be classed with those in which a primary lesion is to be found in the ribs, cartilage, or muscle, and in which the breast itself is involved by extension.

TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, October 14, 1896.

ANDREW J. McCOSH, M.D., in the Chair.

GASTROSTOMY BY KADER'S METHOD.

DR. WILLY MEYER presented a man upon whom he had performed gastrostomy for malignant obstruction of the pylorus by Kader's method. He first pointed out briefly the respective advantages and the modes of operating of the former three useful methods of gastrostomy,—viz., Von Hacker's, Witzel's, and Ssabanejew-

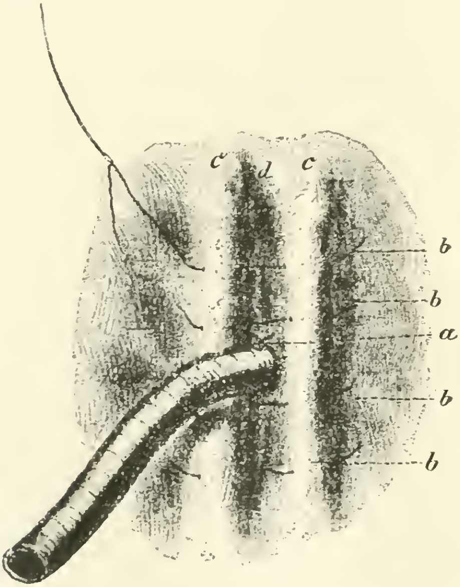

FIG. 1.

Frank's. Lately he had specially made use of the Von Hacker and of the Frank method, since 1894 in nine cases, but had not employed Witzel's on account of the trouble which is sometimes encountered on bluntly dividing the abdominal muscles in the line of Fenger's incision. He then mentioned the advantages of Kader's method, which he had first employed in a case last July, shortly after the first description of it was first published, and explained, with the help of diagrams, the different steps of the operation. The four figures (see Figs. 1–4) show these different steps, including the manner of introducing the sutures. The course of the operation is as follows (see *New York Medical Journal*, November 7, 1896): After blunt division of the left rectus muscle—no doubt the most preferable road—the abdomen is entered, the stomach pulled forward and primarily opened by a very small incision. A drainage-tube of the size of a lead-pencil is at once introduced and fastened to the gastric wall by a catgut stitch (Fig. 1, *a*). Then a fold of the stomach wall (sero-muscular layers) is raised on either side of the tube about half an inch wide, and the two are drawn together by sutures, two above and two below the tube (deep occlusion-sutures). (See Fig. 1.) (These folds can also be placed in a transverse direction in cases of cicatricial stenosis of the œsophagus.) Then a second fold is stitched on top of the

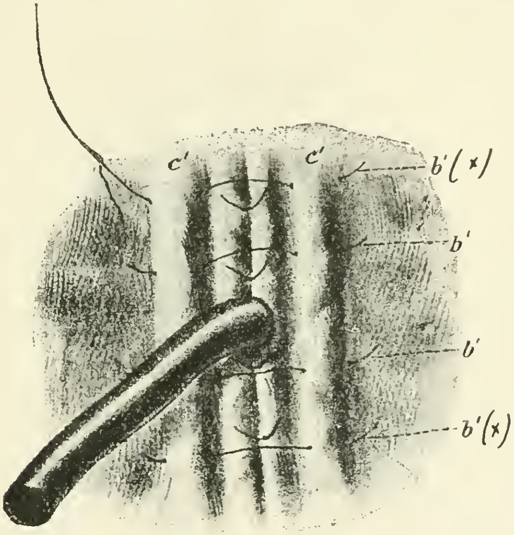

FIG. 2.

first in the same manner (superficial occlusion-sutures) (Fig. 2), and the field of operation placed extraperitoneally by passing sutures through transverse fascia and peritoneum, which catch the stomach on their way. (Fig. 3.) (This part of the operation is greatly facilitated, if the outer threads of the superficial occlusion-sutures be left long (Figs. 2 and 3, *b′* (*x*)), in order to have a good hold on the stomach.) Thus the tube is situated in a funnel, and everywhere surrounded by serosa, which rapidly agglutinates to its opponent (Fig. 4). The wound in the abdominal wall is then sutured, layer by layer. Primary union is expected, and when it takes place the patient can be up on the second day and be discharged in a short time.

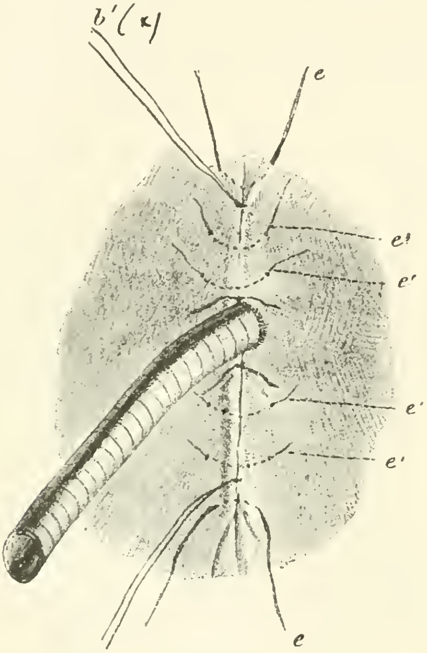

FIG. 3.

In his case the operation was performed on July 21, and the man was up on the 24th, and was discharged a week after the operation with the wound firmly healed. When presented, he could cough and make all bodily movements without any leakage. The tube should be held firmly in place, should not be left out for any length of time unless it was desired to let the opening close, which it would do within eight or ten days. Kader's operation was easy to perform, gave the least amount of trouble afterwards, and was satisfactory in every regard.

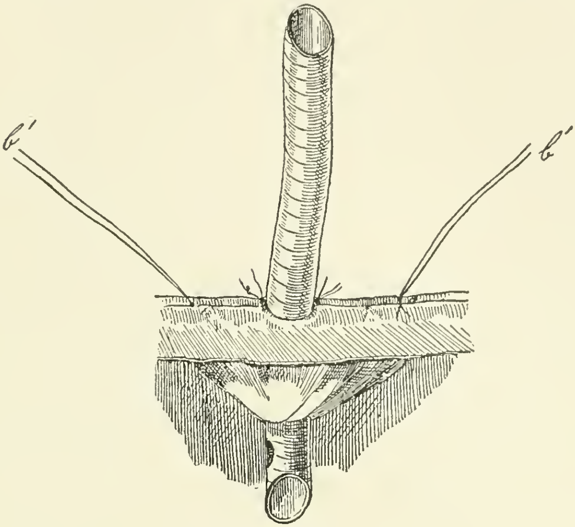

FIG. 4.

EXCISION OF DISEASED CORTICAL TISSUE FOR TRAUMATIC EPILEPSY.

DR. MEYER again presented a man whom he had shown to the society a year before, who, in 1888, while in Texas, had sustained an injury of the left side of the skull in the temporal region, for which he was trephined four weeks later, a small button of bone being removed. He remained well until the early part of the summer of 1894, when he began to have violent epileptic fits preceded by acute mania. He then came to New York under Dr. Meyer's care, who raised the scalp and periosteum, and found a cerebral hernia inside the small trephine opening. He freed the portion of the brain by removing the surrounding bone with the rongeur forceps, and then placed a piece of celluloid plate beneath the periosteum, closed the wound, draining the epidural space through a small cut in the plate at either end of the defect, removed the drain on the fourth day, discharged the patient after two weeks with the wound healed and all the symptoms much improved. He returned to work in Texas, but in February, seven months later, was again taken with epileptic attacks, although far less severe in character than formerly. Returning to New York, Dr. Meyer on March 13, 1895, raised the same flap, removed the plate which was firmly held in place, connective tissue passing from its lower to the upper surface through the lateral cuts, made for drainage, and found that the bone had reformed, probably with the help of the moist blood-clot beneath it to a considerable extent, so that the brain almost formed a small hernia in the dura mater again. He then bit away a very large part of the skull, chiselled a step into the bone, and implanted on it another celluloid plate. Primary union took place within two weeks. The man again returned to Texas to his former employment, but the first part of this year, 1896, mild epileptic attacks recurred, and while talking to any person he would be overcome with sleep. Having entered the New York Post-Graduate Hospital, Dr. Meyer again raised the flap, took out the celluloid plate with the determination to remove the diseased cortex. The plate could this time be raised with the greatest ease, but it was evident that the blood underneath the plate had organized. The dura mater was about one-third of an inch thick. He incised and reflected the dura and removed a piece of the cortex the size of a silver dollar. There was a good deal of hæmorrhage, which was checked with gauze packing. He closed the wound after forty hours by secondary suture; primary union took place. It was not thought advisable to replace the plate at the same sitting lest the blood-clot should organize and form a thick, fibrous tissue which would eventually press upon the brain. The man was then well again, and took a position on a street-car as conductor in Jersey City. After six months of perfect health, attacks of loss of memory and sleepiness, also slight epileptic convulsions appeared. Dr. Meyer had not removed the centre for the right arm, which, it seems, he ought to do now, in view of the fact that the attacks had begun in the right arm. He had proposed to the patient to raise the flap a fourth time, extend the opening, and remove the arm centre. Thus far, although three operations had been required, the man had been materially improved and brought back to his family and his work.

THYROIDECTOMY.

Dr. F. Tilden Brown presented a man, twenty-nine years of age, born in Hesse, Germany, who entered Trinity Hospital April

24, 1896, suffering with tracheal pressure-effects from a large bronchocele. The tumor was of a nearly uniform oval shape, a trifle more prominent on the left side, four inches and a half long, and three inches in transverse diameter. Prominence of the thryoid gland was noticeable when he was eight years old. It increased but moderately until four years ago, when, on coming to this country, its growth was much more rapid. A thin face, sallow skin, and dull, rather listless manner was noticed. Otherwise his personal history was negative. A sister of his father had had a goitre.

Thyroidectomy was performed April 27, the tumor was approached gradually until he came down upon cellular tissue lying directly upon the capsule, when the work of ligating almost indefinitely was commenced. The slightest touch caused bleeding, the least inattention would detach ligatures already applied and greatly lengthen the operation. The superior thyroids were ligated some distance from the tumor. The operation took four hours. The number of ligatures was very great, and the supply of catgut giving out, Dr. Brown thought one or two must have been of silk, for the patient had a small sinus which still refused to heal.

The pathologist's report was as follows: Alveoli uniformly very small, for the most part few, with a great deal of interstitial tissue. Cells cubical, none cylindrical, sometimes flat. Some alveoli are without contents, some have contents staining with eosin. Interstitial tissue abundant, poor in cells, rich in eosinophile material irregularly distributed. It was, therefore, a parenchymatous or adenomatous enlargement of the thyroid.

HIP-JOINT AMPUTATION FOR SARCOMA.

Dr. F. T. Brown presented a woman, twenty-five years of age, who had recently been subjected to amputation at the hip-joint for sarcoma of the femur. The operation was done at Trinity Hospital, by Dr. C. P. Tucker. Dr. Brown had assisted at the operation, and had used the clamp devised by him for controlling hæmorrhage (Annals of Surgery, February, 1896, p. 162). In this case he again had found the adjustment of this clamp to be easy and its service to be complete.

ANKYLOSIS OF KNEE WITH INWARD ROTATION OF LEG.

Dr. Virgil P. Gibney presented a girl, fourteen years of age. Father died of tuberculosis. She passed through all of the eruptive fevers. There was first trouble with the knee when she was a year and a half old. When seven years old she was taken to Bellevue Hospital, where resection of the knee was performed. While in the hospital she fell and fractured the leg. It was after recovery from this fracture that the operation on the knee was performed. After leaving the hospital the knee began to bend out, and had continued to grow worse, with the result of directing the foot inward across the other leg. There was flexion, ankylosis, and four or five inches shortening. Dr. Gibney asked the opinion of the members of the society as to the best method of treating the case. He had thought of doing a simple osteotomy above the condyles, and attempt to bring the limb into as good position as possible.

DR. ABBE thought a large part of the shortening of the limb in this girl to be due to the early age at which the knee resection was made, and was an argument against resections in early life. He thought the present deformity could be overcome by taking out a wedge-shaped piece from the lower portion of the femur.

DR. McCOSH had operated upon a girl whose case was almost the counterpart of that of Dr. Gibney's. The knee had been previously excised at one of our hospitals, when she was thirteen or fourteen years of age. When seen by him she was eighteen years old, the limb was short, there was union at the knee at an angle of forty-five degrees, and inward rotation. He performed practically a second excision and put the limb up straight, obtaining an excellent result. He found three or four silver-wire sutures in the bone, which had been present since the first operation, and around them was an area of bony softening.

CONGENITAL DEFORMITY OF LOWER LIMB.

DR. GIBNEY presented a girl, fourteen years old, with a number of congenital deformities, the most interesting of which related to the leg. In the right hand the index-finger was present, the middle finger was rudimentary, the ring-finger seemed to be present, the little finger was absent. A similar condition was seen in the right foot, and the foot was in extreme valgus and slight equinus. There was a depression on the anterior surface of the tibia; there was little if any fibula. On the left side there was a thick, short thigh, rudimentary femur, no fibula, a small, short tibia and leg, foot in extreme equinus, about three metatarsal bones, and three toes were present, one toe was cleft.

Dr. Gibney asked whether any operation could be performed which would give a useful stump for the attachment of an artificial limb.

Dr. Abbe expressed the opinion regarding this case that the bones being fairly natural at the thigh, knee-joint resection could be made, bring the leg in a straight line with the thigh, thus obtaining bony ankylosis, and making a useful conical stump for the attachment of an artificial limb. Dr. Meyer concurred in this opinion.

RHINOPLASTY.

Dr. McCosh presented a man on whom, six months before, he had brought down a thin layer of bone and soft structures from the forehead to build up a new nose, after removal of an extensive ulcerating epithelioma, including part of the nasal bones. One or two additional operations were performed by himself and by Dr. Brown, which had given the man a passable nose, although it was rather flat and would be improved by the insertion of an aluminium bridge, but the patient was satisfied with its present appearance. There was tendency of the tissue to contract and close the nostrils. Primary union had resulted, and apparently the thin bony layer which had been chiselled from the frontal bone had retained its vitality, as there had been no suppuration, and the solidity of the bridge of the new nose was very marked.

EPILEPSY FROM CORTICAL CICATRIX; TREPHINING; SUBDURAL IMPLANTATION OF RUBBER TISSUE.

Dr. R. Abbe presented a man, aged forty-five years, who, in March, 1894, while standing by a stove, felt his right hand fall asleep, and then begin to twitch. The convulsion then became general, and he fell unconscious.

This was repeated a month later, and then oftener, until two or three occurred daily, and, finally, seven or eight general epileptic convulsions daily, always beginning in the right hand.

Meanwhile he had been taking bromides liberally, under the care of Dr. Graeme Hammond, who referred him to Dr. Abbe for operation on the hand-centre.

March 16, 1895. The dura was exposed over the hand-centre by a horseshoe-shaped incision and chiselled groove. The dura was incised by a corresponding but smaller flap, and found to be tightly adherent to the cortex. It was necessary to dissect it off with scalpel to avoid lacerating the convolutions. A thickened and occluded vessel ran across in the dense adhesions binding dura to gray matter, and was dissected away with the dura from the latter.

The convolution beneath was abnormally dusky, but presented no tumor or sense of hardness.

Beyond this space, which was about an inch in diameter, there were cobweb-like adhesions not more than a quarter of an inch beyond the cut in the dura.

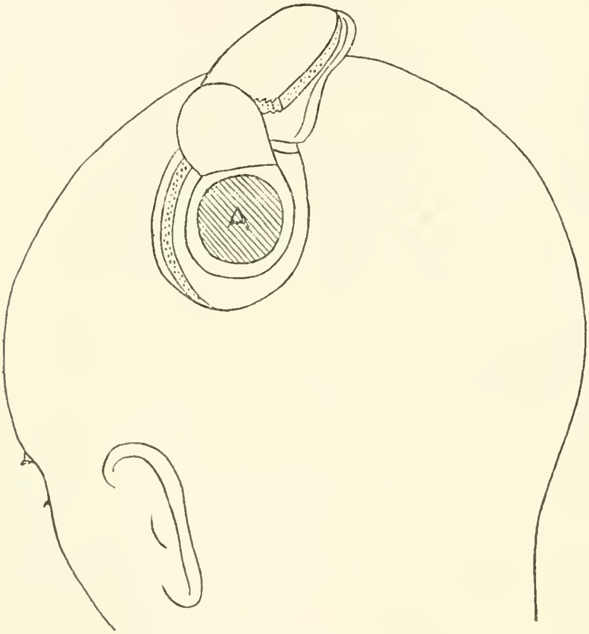

FIG. 1, A.—Abbe's case of trephining with subdural implantation of rubber tissue.

A circle of sterilized rubber tissue one inch in diameter was now laid upon the brain and the dura sutured over it with fine continuous gut. (See Fig. 1.)

The osteoplastic flap was replaced with a small drain. Primary union occurred. One year and seven months have passed and not a convulsion has occurred. The patient is now attending to his work and is in excellent health.

HARTLEY'S OPERATION FOR TRIFACIAL NEURALGIA; EXTRADURAL IMPLANTATION OF RUBBER TISSUE OVER FORAMINA OVALE AND ROTUNDUM.

Dr. R. Abbe presented a man on whom he had performed Hartley's operation three months before for the relief of violent tic douloureux. The patient was forty-six years of age. For three years he had suffered from violent spasms of tic douloureux of the right side of his face, for which he had been subjected to extraction of half his upper teeth, and to two external operations upon the second branch through incisions in the cheek. The relief had been very brief. The spasms had become so intolerable that the patient had contemplated ending his life.

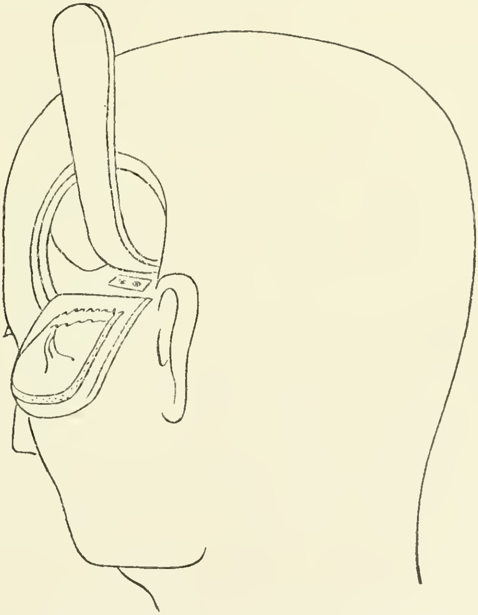

Fig. 2.—Abbe's case of Hartley's operation with interposed rubber tissue.

On July 31, 1896, Dr. Abbe did Hartley's operation for intracranial neurectomy, at St. Luke's Hospital.

The hæmorrhage on every side was very grave, and did not allow of his exposing the nerves at the internal foramina satisfactorily.

He therefore packed the deep wound with iodoform gauze. In twenty-four hours he removed the packing, and continued dissection with great care, but the deep hæmorrhage was too severe to permit him to complete the neurectomy.

The packing was renewed and left two days longer. Then, on removing it, an excellent exposure of the second and third branches was made. Each was clamped in the bite of an artery-forceps and cut off at its foramen.

Evulsion from the Gasserian ganglion was done by rotating the forceps. Less than a half inch was torn out, and hæmorrhage was again profuse. After a few moments' pressure, an attempt to curette away the ganglionic tissue was made, but the bleeding again forbade it.

Fearing future union of the divided branches, it occurred to him to interpose a small sheet of sterilized rubber tissue under the ganglion. (See Fig. 2.)

He therefore laid a rectangular piece, an inch long by half an inch wide, over the foramina rotundum and ovale and pressed it down by iodoform gauze, which was left *in situ* for another day.

On August 4, completing the fourth day from operation, the gauze was removed; all bleeding had ceased; the rubber tissue remained flat over the foramina; the ganglion and dura mater settled upon it; and the wound was closed by few sutures, no anæsthetic being required, as anæsthesia from nerve section included the temporal region.

The patient left the hospital perfectly well three weeks from the date of operation.

He has had as yet no recurrence of pain, although only three months have elapsed.

Dr. Abbe presented the patient for the special purpose of illustrating this new principle of the interposition of a sheet of rubber tissue as a permanent barrier to the reunion of divided intracranial nerves, which may obviate the extensive destruction of the Gasserian ganglion.

How much the injury of the cerebral tissue at the base has had to do with occasional cerebral abscesses one cannot say.

It is possible, however, that the best results may be obtained by simple division of the branches at the internal foramina without evulsion, and by the interposition of a suitable piece of sterilized rubber tissue.

TECHNIQUE OF ALEXANDER'S OPERATION.

Dr. Robert Abbe read a paper on "A Method of Dealing with the Round Ligaments in Alexander's Operation for Shortening Them." (See Volume xxiv, page 699.)

Dr. Charles K. Briddon said he had on several occasions tried passing the ligaments through the skin and tying them, but the result had not been satisfactory. It might prove different with Dr. Abbe's new method, and he would try it.

Dr. McCosh believed that Dr. Abbe was more enthusiastic than were most gynæcologists and surgeons with regard to the results of Alexander's operation. He was certainly more enthusiastic than himself. He (the speaker) had performed it about one hundred times, had found it to retain the uterus in place in about 90 per cent. of the cases, and a great majority of the patients were decidedly benefited. About 75 per cent. were cured, and 25 per cent. not cured. Perhaps half of this 25 per cent. were no better than they were before the operation, and the other half showed improvement in greater or less degree. He had tried Dr. Abbe's methods in a good many cases, and considered them very clever procedures. In the use of Dr. Abbe's original method, wherein he tied the ligaments in the median line, he had had, like Dr. Briddon, trouble from sloughing of the knot. He had also sewed up the canal with the ligament, as described by Dr. Abbe. But it seemed to him that it tended to weaken the external oblique muscle to pass so thick a body back and forth through it. He thought that there was danger that the tendon might thus be split, and he had given up the method for that reason. He did not know whether Dr. Abbe had had any cases of hernia, but he had himself had two, and had seen at least eight or ten in patients operated upon by other men. In four or five cases of hernia the operation which had been done was that at one time advocated by Dr. Edebohls, which he did not think was a good one, —viz., the splitting up of the inguinal canal to the internal opening. As far as he knew in none of these cases had Dr. Abbe's method been employed.

Dr. McCosh had not seen gangrene of the ligament follow after the more recent of Dr. Abbe's methods, but only after his older method of burying the knot subcutaneously. It did not necessarily imply infection, as he understood Dr. Abbe to suggest.

Dr. Abbe regarded the question raised by Dr. McCosh, of the prevention of hernia, as an essential one. Sewing up of the canal with the ligament gives just the result which is desired, binding the transverse fibres of the canal together permanently with living tissue. As to gangrene of the knot or cord as woven into the walls of the canal, unless there was suppuration it never occurred. It would occur, however, if there was suppuration, and for that reason the most careful technique must be observed. He used instruments alone in handling the ligament, for the fingers should be kept entirely out of the wound. Regarding cure, the retroversion could be overcome in every case, but certain symptoms might remain if they were not due to the displacement. Dr. Abbe had never seen gangrene.

Dr. McCosh had not seen gangrene after the method practised by Dr. Abbe, but had seen it after the older method of burying the knot subcutaneously. It did not necessarily imply infection, as he understood Dr. Abbe to suggest.

GASTRO-ENTEROSTOMY WITH MURPHY BUTTON; POST-MORTEM CONDITIONS.

Dr. Charles K. Briddon reported the following case: A man, aged thirty-nine years, who was admitted to his service in the Presbyterian Hospital in September, 1896, greatly emaciated and presenting a distinctly palpable tumor of the stomach, was submitted to gastro-enterostomy on September 23 following. When the abdomen was opened the transverse colon first presented, and above it the stomach. In the latter was a mass occupying the whole of the lesser curvature from cardiac to pylorus and about half of the anterior wall. A large dilated pouch was present at cardiac end.

The transverse colon was drawn up and the meso-colon located. It was intended to go through the latter into the lesser peritoneal cavity and thus reach the posterior wall of the stomach as the point of anastomosis. Apparently no omental attachment to colon existed, however, so there was no anterior wall to lesser peritoneal cavity. Owing to this condition the above intention was abandoned, and a portion of healthy stomach in the dilated cardiac end was chosen for the point of opening. To this a piece of intestine, presumably the jejunum, about six inches from the duodenum, was fastened in the usual way by means of a Murphy's button. The anastomosis was made in front of the transverse colon owing to the peculiar omental arrangement above mentioned, instead of behind, as is preferred.

On the following day, a good recovery from anæsthesia having been made, rectal alimentation was instituted, nothing being given by mouth. The patient vomited some blood and some fæcal matter. There was absolutely no distention or other sign of intestinal obstruction, and the fæcal vomiting was only explained on the theory that the ileum and not the jejunum had entered into the anastomosis.

This reasoning was strengthened when on the third day the patient vomited the nutritive enemata almost unchanged. After this the patient refused to take enemata, and small quantities of fluid were given by mouth, but everything was thereafter vomited again sooner or later, the vomitus often being fæcal.

On the twentieth day after the operation he died from starvation. The button used in the anastomosis had not been recovered.

Autopsy showed that the peculiar omental arrangement mentioned in the description of the operation had been due to the absorption of the omentum in the general emaciation which had taken place. The peritoneal folds usually entering into the formation of the omentum were represented in many places by a mere meshwork of connective tissue.

The button was lying free in the dilated left end of the stomach.

There was a perfect anastomosis between the stomach and the ileum, six inches from the cæcum, the remainder of the small intestine being completely collapsed and out of the alimentary circuit. From the point of anastomosis the proximal and distal pieces of intestine lay parallel and were closely united for a distance of three inches, so that their identity was only made out after cutting them across and finding two lumens. The proximal portion was atrophied and so closely bound down that it was only with difficulty that an opening between it and the stomach was made out.

The distal portion, on the other hand, was dilated, and the opening from it to the stomach was large and direct, giving the appearance of an end-to-side anastomosis.

INTESTINAL OBSTRUCTION BY GALL-STONE.

Dr. Briddon presented a gall-stone, weighing 400 grammes, that had caused a fatal intestinal obstruction in the case of a man, sixty-seven years of age, who had suffered from attacks of severe abdominal pain for twenty years. For a long time the attacks occurred every week or two, especially when he was tired by standing. On giving up the position that required him to be much on his feet, they became less frequent, and for the last three or four years had only occurred every three or four months.

On the 16th of May he began to suffer from severe paroxysmal pain in the epigastric region. After about twenty-four hours he began to develop the symptoms of acute intestinal obstruction; after these symptoms had persisted for about twelve hours, he was submitted to operation by the reporter, in the presence of Drs. Edward Bleecker and Ellsworth Eliot, Jr.

The abdomen was opened by an obliquely transverse curvilinear incision two inches below the border of the right ribs. The gall-bladder was contracted, and no evidence of calculus in any of the ducts was found. The beginning of the small intestine was then found, and its whole extent explored by drawing out a loop, passing it through the fingers, and returning it to the abdominal cavity until the lower end of the ileum was reached. The intestine was much injected, and became more distended as its lower end was neared. Finally, a hard, solid mass was found occluding the lumen of the gut; a straight incision a little more than one inch in length was made along the free margin of the bowels, and the obstructing body was removed; the incision was closed by a continuous suture of black silk passing through all the coats, and supplemented by a second interrupted Lembert suture, a tamponnade of gauze was placed in contact with the line of suture, and the rest of the abdominal wall was closed with silkworm gut.

The calculus weighed 400 grains, was a long olive in shape, in those parts of it which had been apparently in contact with the walls of the intestine it was coffee-colored, all other parts were covered with fine transparent glistening crystals. Its laminated structure was made evident in the process of cleaning. Under a strong current of water when a large flake was detached, on the exposed surface beneath, could be seen the same glistening crystals, but in inconsiderable numbers. Its longest circumference was five inches and a half, shortest four inches.

The condition of "ileus paralyticus" persisted, the vomitus being stercoraceous in spite of lavage. The temperature only reached 100° F. on one occasion, pulse ranging between 92 and 104, but he had frequent attacks of cardiac failure. On the afternoon of the

21st, after emptying the stomach with the siphon, he had ten grains of calomel; in four hours after his stomach was again emptied, and half an ounce of salts introduced; the following morning he passed much fetid gas "per anum," and it was soon followed by a fluid movement; the vomiting ceased and did not recur; he expressed himself as feeling much better, and his improved appearance justified the opinion that was expressed by his medical attendants that the danger was passed; but on the morning of the 23d he went into collapse, from which stimulation of the most active kind could not restore him, and he died at 3 P.M. on that day.

Stated Meeting, October 28, 1896.

A. J. McCosh, M.D., Vice-President, in the Chair.

ARTIFICIAL NOSE.

Dr. William B. Coley presented a woman with an artificial nose attached to spectacles, illustrating excellent cosmetic effects, after complete excision of nose for epithelioma. She was forty years of age, of good family history. Nine years ago a small scab appeared on the tip of the nose. Eight operations had been performed up to February of the present year, all followed by rapid recurrence. At that date the nose was much infiltrated and thickened, of purplish color, and was the seat of small ulcers. A piece was removed and found to be epithelioma. The diseased tissue was then all excised, and after the wound had healed the artificial nose was fitted. The cosmetic effect was better than could be secured by a plastic operation.

LAMINECTOMY FOR FRACTURE OF THE VERTEBRÆ.

Dr. B. B. Gallaudet read a paper entitled "Laminectomy for Fracture of the Vertebræ, with Report of Three Cases." (See page 28.)

Dr. George Woolsey said he had had no experience with laminectomy, but had rather avoided it, partly on account of its mortality, and had tried the method described by Dr. Dennis before this society, perhaps two years ago, consisting in traction and the application of a plaster-of-Paris jacket. He had, however, obtained only fair results from this method. Sensation improved, and motion returned partly in some cases, but after a time the improvement gradually slowed up, and a point was reached at which there was vacillation to and fro. Complete recovery had never taken place in his cases. Therefore he had reached the conclusion that, so far as the lumbar region was concerned, he would have no objection to trying laminectomy. With regard to operative technique, it seemed that Dr. Galludet's experience with the chisel and mallet on the spine did not correspond with his (Dr. Woolsey's) on the skull. He had not found this method objectionable on account of concussion when raising a bone-flap on the skull, but the effect might be different in laminectomy.

Dr. R. H. M. Dawbarn endorsed most heartily the views expressed by the author. They agreed perfectly with what he had thought was right in the matter when a few months ago he had presented the case alluded to in the paper and in which he had performed immediate laminectomy. Two members then dissented from that view, and stated that it might be that the patient would have done as well without the operation, although it had resulted in finding and removing two spiculæ of bone sticking into the cord. But we knew what the results were in waiting with spinal fracture and paraplegia,—they were nearly hopeless. Although he would not hesitate to do a late operation for relief of bed-sores, or severe pain, yet the really hopeful cases were those seen and operated upon within a few hours after the injury. He attributed the recovery in the case already alluded to to the fact that he operated within two or three hours after the patient had sustained the fall. Of his other two cases of laminectomy, both in the dorsi-lumbar region, one was reported in the *New York Medical Journal* about ten years ago, the last dorsal and first lumbar vertebræ having been fractured. The third case had not been published. It occurred about two years ago, upper lumbar region, recovery. Thus all three of his patients had recovered from the operation—justifying in this regard the regional prognosis given in the paper just read—and their symptoms had been ameliorated. The first patient, operated upon ten years ago, was still living, and was able to go about in a carriage and attend to his duties as an inspector, although still a paraplegic. The pain and bed-sores were cured. The other two patients also are still living; and the one last shown here—who fell four stories and broke her back—is now earning her living once more as a house maid, the recovery from paraplegia having become perfect.

Regarding the technique of the operation, in each of his cases he had used the Hey saw and rongeur forceps. He thought the chisel, as Dr. Gallaudet had said, might add to the shock. In operating on the head it was his custom to have it supported in the hands of an assistant while chiselling, thereby greatly lessening the jar; but nothing similar could be done in operating on the spine, and he thought the cord must feel the jar of the chisel.

Dr. A. J. McCosh thought Dr. Gallaudet had been wise in dividing the cord into different regions in estimating the mortality-rate from laminectomy. The mortality seemed to Dr. McCosh altogether too high,—39 to 50 per cent. It certainly was too high if the death-rate was attributed entirely to the operation. He thought that in the majority of cases the deaths could not have been due to the operation, but to the condition for which the operation was done.

The speaker was of the opinion that the cases should also be distinguished as far as possible according to the amount of injury done the cord. For instance, distinguish those in which there was absolute loss of motion, sensation, and the reflexes from those in which motion and sensation were only partially lost and the reflexes were retained. The loss of tendon reflex was a most important symptom. In the cases which he had seen when the knee reflex was absolutely abolished, the prognosis had been absolutely bad, but when not abolished there was a distinct chance for recovery if, as Dr. Gallaudet had advised, an *immediate* operation were performed.

His own experience with fractures of the spine had not been very extensive, but he had done a good many laminectomies for various conditions—ten or twelve—and he believed none of the patients had died in consequence of the operation. He believed none had died within two weeks after the operation. As to the chisel, he had found it a very unsatisfactory instrument. Ordinary rongeur forceps of different sizes and shapes had given the greatest satisfaction.

Dr. McCosh said it had so happened that the most satisfactory case which he had ever had was one in which the fracture was situated high up, involving the fifth and sixth cervical vertebræ. The operation was done six years ago, and the man was now practically well.

Dr. Charles K. Briddon regarded the use of the hammer and chisel as very dangerous. In the majority of fractures of the laminæ in the upper portion of the column, the body of the vertebra was also fractured, and the force required in the use of the hammer and chisel upon dense bone like the laminæ would tend to displace the body forward and produce more or less compression, and possibly division of the cord itself. Judging by what he had seen of laminectomy, he could not conceive of a better instrument for the purpose than the rongeur forceps. He thought it was a safe instrument, and certainly preferable to the hammer and chisel. One reason why fracture in the upper portion of the spinal column was more serious than in the lower portion was the fact that in the former locality fracture and displacement of the body of the vertebra was a much more frequent complication.

EDITORIAL ARTICLES.

QUESTIONS INVOLVED IN THE PRACTICE OF CASTRATION FOR ENLARGED PROSTATE.

On page 121 of this issue will be found a communication from Dr. Cabot, of Boston, upon the above subject. Some of the statements therein contained seem to merit notice.

In spite of Dr. Cabot's objections to editorial criticism of his writings in the same number of the Annals in which they are published, it seems to the editors both more satisfactory to the readers and more complimentary to the author when this method is pursued, and it will therefore be adopted in this instance. Moreover, as such editorials in this journal are, as in the case of the one of which Dr. Cabot complains, invariably signed by the writers, it seems unwarrantable to ascribe to them, on account of their being on the editorial pages, a "presumably" judicial character, or to compare them with the charges of judges or the rulings of courts in a way that implies injustice to the author whose paper is discussed. Such discussion of papers that seem to editors especially noteworthy or interesting is exceedingly common both here and abroad, and should be more so.

Dr. Cabot objects to the statement that many patients have been subjected to castration in whom prostatectomy would not have been thought of, and asks that all reports be received and considered equally. He presently quotes Dr. Keyes in regard to a case which will be mentioned shortly. Let me quote Dr. Keyes in at least partial support of my position. In June, 1895, Dr. Keyes said,[1] "I have never done this operation but once, and I don't care to speak of the experience of others. These experiences are in print, and the only possible objection is that the greater number come from people who have no other claim to credibility than the fact that they write,—that is, the majority of the reporters. If not a majority, at least many of the reporters are not skilled observers."

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[1] Boston Medical and Surgical Journal, August 22, 1895.

Dr. Cabot selects Case 25 of his table, which I said should not be counted in estimating the mortality, as an example of a "mistaken correction" of his statistics; he quotes Dr. Keyes as saying "there is no excuse for ruling the case out." Dr. Keyes, however, reported the case[1] as one of "recurrent prostatic suppuration" following a prostatic abscess, which had been preceded years before by a suppurating testicle. He said the patient was "somewhat of a bleeder." The day following the operation one wound was reopened and a "moderate clot turned out." At the end of a week he had a strangulated hæmorrhoid, "and from that a slight erythematous blush and a sort of ambulatory erysipelas ensued." He died at the end of five weeks. Dr. Keyes said he had a "*moderate* enlargement of the prostate." These seem to be the facts. It must be left to the judgment of the profession whether or not such a case should be included without comment in a table purporting to show the legitimate mortality of castration for hypertrophy of the prostate, an operation obviously inapplicable to many cases, especially, perhaps, to those in which suppuration is present. Dr. Keyes himself said that he operated against his own judgment.

Dr. Cabot talks of the "garbling" of statistics. It seems proper to call his attention to the fact that such a term would be applicable only if the cases picked out as improper ones for use in reaching conclusions were suppressed. In my table of castrations every case I could hear of or had seen published was included, even when the patient was moribund at the time of the operation or when death had occurred long afterwards. Dr. Cabot wants each reader to have the opportunity "to make such allowances for chances of error as seem to him fair." May not the proposer of an operation, even if he happen to be also an editor, have the same opportunity and publish his views as to the real value of the statistical evidence? Dr. Cabot takes this privilege himself when he puts in a separate table the cases complicated with stone, and excludes them from his calculation of percentages. I did not intend to disagree with him as to the propriety of so doing, but I must continue to contend that in estimating the danger of castration for hypertrophied prostate, such cases as that of Dr. Keyes should be excluded, as should cases of gangrene of the leg, perforation of the bladder, and cases like No. 8, of Dr. Cabot's table, in which instance a patient who was castrated on account of chronic neuralgia of the testes, and who died of uræmia one year later, is included in the death-list, and helps to swell the mortality percentage.

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[1] Boston Medical and Surgical Journal, August 22, 1895.

Can there be any reasonable doubt of the propriety of throwing out such a case in attempting to reach a fair and just decision as to the real danger of the operation?

Dr. Cabot more than intimates that my views as to the death-rate of prostatectomy have changed, as a result of personal bias in favor of an operation introduced by myself. He says that in 1893 I "fixed the death-rate" in prostatectomies as low as 14.9 per cent., and adds, "In a later paper, for purposes of comparison with castration, Dr. White goes back to the death-rate of the first published set of prostatectomies (25 per cent.)." It is almost inconceivable that Dr. Cabot could have failed to observe that in 1893, as I was then comparing suprapubic and perineal prostatectomies, I wrote, "The difference in mortality, if we may venture to compare the last half of Moullin's table of suprapubic prostatectomies (which comes nearest it in dates) with his table of perineal operations, is not a very serious one, showing for the suprapubic operation seven deaths in forty-seven cases (operated on since June, 1889), a mortality of 14.9 per cent.; and for the perineal operation two deaths in fourteen cases (operated on with one exception since June, 1891), a mortality of 14.3 per cent." In other words, the percentage of 14.9 was, with an expression of hesitation, based on operations done during a certain period, and for the purpose of instituting what seemed a fair comparison with the mortality of the cases of another form of prostatectomy done during approximately the same period. In the later paper (1895), I wrote, "The mortality of the first series of suprapubic prostatectomies published was 25 per cent. The mortality of my table of a slightly larger number of cases of castration is 18 per cent., including every known death, even when it occurred months after operation." That is, I took the whole of each of the first tables published as to these two operations and compared them.

Dr. Cabot's query as to what has altered my opinion requires no answer, but I may add that his statement that the more recent papers on prostatectomy show a decreasing death-rate is, so far as I know, based on very few papers and very few cases.

As to the other points raised by Dr. Cabot in this letter. there is, of course, room for honest difference of opinion, but taking them *seriatim* my own views are as follows:

As the few deaths after litholapaxy occur chiefly in old prostatics, a preliminary castration will probably reduce the mortality of the former procedure, and is to be preferred to a suprapubic operation. If Dr. Cabot had said in his original paper that the removal of a stone *at the same time* that the castration was done would "add considerably to the dangers of the operation," there would have been no cause for disagreement; but my own experience and Dr. Cabot's statistics seem to point unmistakably to the incorrectness of his present position. Of his six cases of "castration complicated by stone," two, Nos. 1 and 6, were first castrated, and later operated upon for stone. No. 1, in whom the stone was crushed, made an almost complete recovery; No. 2, in whom a suprapubic operation was done, survived and was benefited. Nos. 3 and 4, who were subjected to castration and suprapubic operation at the same time, died, one on the next day, the other on the ninth day. His contention as to the danger of litholapaxy "superimposed" upon castration does not seem to be supported by his own table, in which there are no deaths after litholapaxy, whether this was done at the same time as the castration (which I believe to be generally undesirable) or was performed after an interval.

There is no good reason for believing that the *immediate* relief of backward pressure on the kidneys is especially important in the average prostatic, and still less for basing on the supposed need for such relief an argument in favor of an operation (prostatectomy) which Dr. Cabot properly describes as "much more severe" than castration.

Reference to Dr. Cabot's paper will show that the criticism which attributes to him positive opinions on points which no one can regard as settled is not without justification. His "conclusion," after the recital of one observation that "castration is of but little use in myomatous and fibrous prostates," is a case in point, and a number of his other conclusions are equally open to objection. There was no intention, however, of misinterpreting Dr. Cabot, and if his views are less positive than his language seemed to indicate, I am glad to know it.

I am not myself convinced of the correctness of the theory I advanced as to a possible cause of the "quick relief which sometimes follows castration." I gave my reasons for the suggestion some time ago.[1] I can only repeat what I said in the editorial Dr. Cabot objects to,—viz., that the possibility of rapid atrophy of the third lobe being a factor in the production of quick relief, "while not proved, is certainly not disproved by such observations as those of Dr. Cabot."

I shall be glad when the time comes to record my experience as to the occurrence of nervous symptoms after castration. But as thus far I have seen only two well-marked cases, and as those patients were both old and with presumably crippled kidneys, I am anxious not to draw "conclusions" from insufficient evidence, and must ask Dr. Cabot to bear with me if I delay.

Finally, I would like to reiterate the opinion expressed editorially in the ANNALS for September, 1896, that nothing in Dr. Cabot's paper (or, I may add, in the letter he now publishes) justifies the belief that prostatectomy has an advantage over castration in the matter of mortality; or the statement that the functional results of the two operations have been as nearly equal as possible; or the assertion that the tendency to relapse shows itself in about the same proportion of cases after either operation; or the exclusion of myomatous and fibrous prostates from the cases in which castration is of great use; or the announcement that prostatectomy is applicable to more cases than castration.

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[1] Annals of Surgery, July, 1896.

Every one of these sweeping "conclusions" of Dr. Cabot may, I assume, be taken to express his "positive opinions" without calling forth an objection from him as to the tone of the criticism. They refer to very important matters in practical surgery. They involve the selection of a proper procedure in thousands of cases in which life is at stake. They may all be correct, but I do not think they are. In so far as they are based on Dr. Cabot's paper the lack of proportion between the evidence adduced and the deductions drawn therefrom seems to me so obvious as to require no further comment.

J. WILLIAM WHITE.

REICHEL ON THE AFTER-TREATMENT IN CASES OF ABDOMINAL SECTION.[1]

THOUGH the after-treatment after abdominal operations has undergone a great change at the hands of modern surgery, still the fact that there still remain certain differences of practice among surgeons indicates that it is still an unsettled question. From the earlier policy of maintaining intestinal quiet with opiates to the ultra-active policy of purgation the lines of surgical practice have differed widely. No surgeon has done more than Reichel to separate the valuable parts of each of these two different policies, and find their most useful application. He observes that while the technique of laparotomy among all surgeons is practically the same in its main points, the after-treatment is almost diametrically different. He has asked two questions, (1) under what conditions is opium indicated after laparotomy? and (2) what are the indications for reopening the belly?

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[1] Verhandlungen der deutschen Gesellschaft für Chirurgie, XXIV Kongress, 1895.

Reichel observes that the use of opium in the treatment of peritonitis originated in the theory that by keeping the bowels perfectly quiet in case of peritonitis the spread of the disease could be prevented, and that thus the use of opium would prevent a general peritonitis. In this way opium came to be used almost universally.

It has been pointed out that a local inflammation becomes a general inflammation by a dislocation of the localized organisms from the primary focus out into the sound tissue. For this reason opium was given in large doses; for it was known that even under strict aseptic precautions pathogenic organisms might become lodged in the abdomen. The greater the absorbing power of the peritoneum, the sooner will the bacteria be rendered inert. This absorbing power is increased not by quiet, but by peristalsis. In the normal progress of a case after laparotomy there is no indication for the use of opium. Of course there are special exceptions to this, for example (according to Reichel), after operation for appendicitis when a local infection exists, and in cases of intestinal resection in which for the sake of security to the suture it is important to keep the gut quiet.

Reichel has pointed out that opium masks the symptoms of a developing intestinal obstruction, and thus prevents the timely application of operative interference. It is also true that it directly favors the formation of adhesions and the development of ileus. It is not the quiet of the intestine which causes the adhesions between them, but injury or loss of the peritoneal epithelium. These adhesions depend less upon the after-treatment than upon the operative technique, but there is no operative technique which will entirely prevent them.

They are usually the cause of intestinal obstruction through angulation. As a matter of fact, adhesive angulation never is alone the cause of total mechanical obstruction. The presence of inflammatory deposit causes more or less circular compression of the gut and damage to its motor power, probably by paralyzing the motor nerves by compression at the place of angulation, and by stretching of the nerves above the point of constriction. Increase of the peristaltic action above this point only aggravates the distention. The use of purgatives in case of angulation due to adhesions, coming on some days after laparotomy, is usually of no value. Repeated washing out of the stomach and the use of opium, better than any other line of treatment, relieve the dangerous acute distention above the angulation. Reichel shows that its use is rational and practicable and is often not only palliative but curative as well. Opium is further of value in cases of infective peritonitis in which the infective foci are confined by adhesions, and in which the chief danger is a rupture of the adhesions and extension of the disease.

In case of acute ileus following laparotomy neither opium nor purgatives are of use; the best chance of recovery rests in the early diagnosis and operative relief. In such cases, the use of medicinal agents which obscure the symptoms are to be guarded against. Reichel teaches that in such cases opium is alone indicated, and purgatives are contraindicated by the symptoms of infectious peritonitis.

The indications for reopening the abdomen are by no means yet agreed upon among surgeons. The only thing upon which surgeons are agreed is the presence of intra-abdominal hæmorrhage; there is a vast diversity of opinion concerning ileus and peritonitis. The difficulty of deciding lies in the diagnosis,—that is, in the difficulty of distinguishing between intestinal obstruction and peritonitis. During the last few years peritonitis has often been subjected to surgical treatment; but the practice of indiscriminate reopening of the belly can only bring the operation into discredit. It is desirable that certain groups of cases be governed by fixed therapeutic rules. From a purely practical stand-point Reichel divides the cases into two groups. The division, which is hardly a scientific one, is as follows: (1) such cases as from the beginning are without fever; and (2) such as run a febrile course. Notwithstanding the many exceptions, in general fever signifies infection and points to peritonitis, while its absence would indicate obstruction. Of course the other symptoms of these two conditions must not be lost sight of.

Reichel says that when the symptoms of intestinal obstruction begin acutely and relatively late, from the tenth to the fourteenth day or later after an abdominal section, after a non-febrile course, or when they suddenly and violently begin on the first day after the operation, the condition is almost unquestionably one of pure mechanical obstruction, which must be treated by mechanical means at the earliest moment. Subacute development points more to adhesions and angulation. In such case opium is often of use. But the case must be watched very closely for the appearance of objective symptoms of complete obstruction, and to avoid overlooking a change of the symptoms for the worse. If betterment is not observed within twenty-four or forty-eight hours, laparotomy should not be delayed. The condition may be mistaken for pseudo-ileus, but the early and pronounced increase in the frequence of the pulse in the latter is of great value in the differential diagnosis.

In cases of peritoneal infection, operative interference is useless and contraindicated when the peritonitis is a general one and not confined by adhesions. Operation can do good only when there is a circumscribed inflammation. Often the symptoms of such a condition resemble the symptoms of intestinal obstruction, differentiated usually by the presence of fever. It is a matter of the greatest importance to differentiate between general peritonitis and peritonitis with adhesions. The hope of therapeutic procedure depends upon such a differentiation. Many signs must be considered; but briefly it may be stated that in the first condition the symptoms of a general infection prevail, and in the second condition the symptoms of a local inflammation prevail most prominently.

In all cases of peritoneal infection, Reichel recommends that, first, an energetic opium treatment should be pursued, in order to localize, if possible, the septic process. When the diagnosis of localized suppuration has been made, whether positively or with the suggestion of intestinal obstruction, laparotomy should at once be performed. In such case the infection is no contraindication to operation. The treatment must be active and radical.

JAMES P. WARBASSE.

REVIEWS OF BOOKS.

A Manual of Obstetrics. By W. A. Newman Dorland, A.M., M.D., Assistant Demonstrator of Obstetrics, University of Pennsylvania. 760 pp. Illustrated. Philadelphia: W. B. Saunders, 1896.

This is the last volume which has appeared in Saunders's New Aid Series, and, like its predecessors, does not attempt to give an elaborate discussion of the subject, or to support statements by a citation of cases. Dr. Dorland has, nevertheless, given an able presentation of obstetrics, and, with the aid of numerous and excellent illustrations, has produced a work which will prove of greater value to a practitioner than many more pretentious volumes.

Clinically, "the vast majority of pregnancies and labors are normal in almost every respect, and physiologic obstetrics should most appropriately command the first attention of the accoucheur. Accordingly, a normal pregnancy and labor in a normal woman are depicted from the time of conception to the weaning of the child, at which time the patient naturally passes from the hands of the obstetrician to those of the general physician." In the development of this idea the chronological sequence of events has been followed, and the changes occurring chronologically in both mother and child from the beginning of pregnancy to the establishment of the mammary function are described.

Division of the subject into chapters is practically abandoned. Physiologic and pathologic obstetrics are the major divisions; subheadings are given merely to facilitate reference.

While, in practice, a knowledge of the first of these is the more important, the complications and accidents which may occur are so numerous that the greater part of the book is devoted to their study.

Diseases of the ovum, fœtal appendages, and fœtus precede the more elaborate discussion of the pathology of pregnancy. In this last section the description given and the treatment recommended in the conditions of placenta prævia and puerperal eclampsia deserve especial commendation.

The most important subdivision of the book is the one devoted to the subject of dystocia, whether due to fœtal or maternal causes. Malpositions, malformations, and abnormalities in the child, and those conditions in the mother giving rise to mechanical obstruction are the chief headings, while among the minor topics may be mentioned the management of face and breech presentations, and the surgical operations of version, craniotomy, and symphyseotomy.

The last two subdivisions deal with the pathology of the puerperium and of the new-born.

When a comparison is made between this book and some of the encyclopædic volumes that have recently appeared, the great value of Dr. Dorland's work becomes more apparent. In many cases the demand for a work continues owing to its past reputation, and edition after edition appears with few if any changes in the text to keep pace with the constant increase of knowledge. In other cases new books are published with a series of articles by different authors, many of whom, unfortunately, have ceased to add to their long-established reputation. In this small volume we have none of the extended historical accounts which fill so many pages in the larger works, but we are given an accurate, concise, and still a detailed presentation of the subject of obstetrics from the point of view of the modern pathologist and surgeon, for to-day a competent obstetrician must be both of these.

A specific comparison will emphasize this difference. In the "American Text-Book of Obstetrics," which has so recently appeared, the most common, most important, and most abused operation in the entire range of obstetric surgery—namely, the use of forceps—is described in practically the same way and with the same illustrations as it was by Churchill and others forty years ago. In

Dorland's book this old but still used (unfortunately) method is dismissed with a mere mention, and the cephalic method only is dwelt upon. Instead of considering the pelvis alone, a correct diagnosis of the position of the presenting part is a prerequisite to an intelligent use of the instrument. In hospitals like the Sloane Maternity this cephalic method has for years entirely supplanted the pelvic mode of application, for it is easier, more scientific, and more effectual than any other; yet it is difficult to find it described in print.

Many similar comparisons could be made in which the balance of credit would remain with the less pretentious volume. The many practical suggestions that it contains will be of especial value to one beginning practice, and the physician of longer experience will find it in many respects the most satisfactory book of reference that can be obtained.

H. P. DE FOREST.

A MANUAL OF MEDICAL JURISPRUDENCE AND TOXICOLOGY. By HENRY C. CHAPMAN, M.D. Second Edition. Illustrated. Philadelphia: W. B. Saunders's New Aid Series, 1896.

The second edition, aside from added bibliography, contains but few additions to the original text.

As before, the subject of medical jurisprudence comprises the first and larger portion of the book. The subject is an important one, and is too much neglected in the medical curriculum and among the members of the profession at large. No attempt is here made to treat the subject exhaustively, but the facts which all practitioners should know are concisely set forth. Among the most important of these general topics are the relations of the physician to the coroner in cases of sudden death, the signs of death, and the manner of making post-mortem examinations in medico-legal cases.

Among the more definite conditions which are apt to involve the members of the medical profession in legal controversies are pregnancy, fœticide, infanticide, and legitimacy; the questions relating to these conditions are rightfully given a very full presentation. Death from various causes, together with insanity and malingering are also subjects of chapters.

The second part of the book is devoted to toxicology. Evidences of poisoning derived from symptoms, and the character of the testimony experts may be expected to give in such cases, fill the preliminary chapter: in the remaining one, after a classification, the most important individual poisons are separately described.

H. P. De Forest.

CORRESPONDENCE.

QUESTIONS INVOLVED IN THE PRACTICE OF CASTRATION FOR ENLARGED PROSTATE.

To the Editors of the ANNALS OF SURGERY.

Dear Sirs: I was much interested in the signed editorial in your issue for September, criticising my paper upon "Castration for Enlarged Prostate," which appeared in the same number. When asked to prepare that paper, I said that I did not think the time had come for settling many of the questions connected with the subject, and I am ready to leave some of the points, in which that editorial expresses an opinion different from mine, to be settled when our experience is wider.

Among this class of questions, not yet clear, and, therefore, merely now a matter of opinion, is the contention that many patients in whom prostatectomy would never have been thought of, on account of their serious illness, have been subjected to castration, and that on this account it is proper to scrutinize statistics and rule out cases which seem to the investigator unfit for the operation.

This source of error should diminish rapidly as the real dangers of castration are understood, and the study of the table in my paper would show, I think, that it plays but a small part in accounting for the mortality. The character of the operators is, for the most part, a guarantee against ill-considered and unjustifiable operating.

It is this sort of manipulation of statistics by investigators who have a strong desire to prove something that brings figures into disrepute, and it was the desire to avoid such dangers as far as possible that led me to ask that my table of cases should be published in full, and so be opened to the fullest criticism.

To illustrate my point from your own editorial, I would call attention to the fact that Case 25 is ruled out on the ground that "the surgeon operated against his own judgment at the urgent demands of the patient." Dr. E. L. Keyes, the surgeon in question, writes in regard to this case, "My patient was in splendid physical health and organically sound. I would have been willing to perform any capital operation upon him, but hesitated to remove the testicles because I did not like to mutilate him unless more convinced that I should help him than I then was. There is no excuse for ruling the case out." Such mistaken corrections as this demonstrate the danger of altering statistics to bear out controversial arguments.

Dr. White says in another place that "it seems probable that the majority of the deaths have occurred in spite of and not because of the operation." I have been at some pains to show my reasons for feeling that in considering the rival merits of two operations for the correction of a serious pathological condition of the bladder and kidneys we cannot properly rule out cases in which that condition is not relieved. (Cases 8, 18, 23, 30, 41, 84 are thus ruled out by Dr. White.) Surely, in considering the rival merits of tracheotomy and intubation, we should not exclude from the death-rate the cases that died in spite of either operation. Moullin's table of prostatectomies can be revised with great improvement in results if cases of that sort are excluded. To avoid garbling the statistics at all seems to me the better way, thus leaving each reader to make such allowance for chances of error as seem to him fair.

In regard to the death-rate after prostatectomy, I quite agree with the opinion that the number of cases is not yet sufficient to establish it, but, after all, we have to form our idea of what it probably is from the cases already recorded. This I tried to do as fairly as possible, and am surprised that my estimate of something under 20 per cent. is not regarded as a conservative one when I find that in 1893 the gentleman whose name is affixed to that editorial utterance fixed the death-rate in these cases as low as 14.9 per cent., and so declared it in his paper before the American Surgical Association. What has altered his opinion in regard to this? Certainly the more recent papers upon prostatectomy show the operation to have a decreasing death-rate. In a later paper, for purposes of comparison with castration, Dr. White goes back to the death-rate of the first published set of prostatectomies (25 per cent.). I believe that I "grasp the idea" of this comparison, and have fully stated my reasons for differing from the comparative estimate thus obtained.

The time is ripe for a careful investigation of the results of prostatectomy, and it is greatly to be hoped that such a search will soon be made and the results fully published.

I am also surprised that my statement that "the removal of a stone adds considerably to the dangers of castration" is not accepted without question. Surely to superimpose an operation like litholapaxy, with a mortality of from 5 to 9 per cent., upon another operation adds materially to the risks of the patient, unless the operation with which it is joined has so high a mortality rate as to make the litholapaxy a mere bagatelle in comparison.

It seems to me, therefore, proper to exclude from our statistics cases in which the two operations were done simultaneously.

In regard to the operation of litholapaxy after castration I said nothing, and I do not see what bearing it has upon the question of whether cases complicated with stone shall be admitted in our statistics of castration for enlarged prostate. Since it is alluded to in your editorial, I will say that while I have no doubt that the shrinkage of the prostate after castration will often make a subsequent litholapaxy easier of performance, still, I cannot believe such a combination of operations to be wise in the majority of cases; for the castration alone seems a more dangerous operation than litholapaxy alone, and should not therefore be joined with it except in case of extreme need.

Sometimes a prostate is so large and the prostatic urethra is so tortuous that crushing instruments cannot be entered through it. In such a case I can imagine that the reduction of the prostate by castration might be considered. Unless, however, the dangers of castration can be reduced from what they now seem to be, I should prefer a suprapubic operation to deal with such a condition.

Furthermore, the truth of my statement that it is a common experience to see symptoms of irritation apparently due to the prostate disappear after the removal of a stone is doubted. I wish to say that I have had numerous instances in my practice in which the removal of a stone has been followed by such subsidence of irritation at the vesical neck that no operation upon or for the prostate was required afterwards; although beforehand it had seemed as if such an operation would certainly be needed.

So common have been these cases that I cannot believe that they have been absent from the experience of others.

Case 6 in my table of "Cases of Castration Complicated by Stone" is a good illustration of such a condition. This patient was first operated upon for stone by Dr. W. S. Halsted, who removed a calculus by suprapubic incision. At that operation Dr. Halsted found the prostate large with a projecting third lobe. Two years later, symptoms of bladder-irritation returned, and he was seen by Dr. S. C. Gordon, of Portland, Me., who, believing the symptoms due to the enlargement of the prostate, performed castration. Less than a month later, the symptoms continuing, Dr. Gordon again examined him, found a stone, and removed it by a second suprapubic cystotomy. Dr. Gordon reported that at this operation he found the prostate almost entirely absorbed, and that three months later he had an "almost normal bladder."

This cannot refer to any restoration of function, for the patient never recovered any power of natural urination, but relied wholly on the catheter for emptying the bladder.

Within six months the vesical irritation reappeared, and ten months after the last operation he was seen by the writer, who again found a stone which he removed by litholapaxy. At this time the prostate was very large and the prostatic urethra was long and resistant. The vesical irritation was entirely relieved by the removal of the stone. Twice within the next three months the patient had a slight return of the irritation, and on each occasion a little concretion was found and removed with a Chismore evacuating lithotrite, under cocaine anæsthesia. Probably the tendency to stone formation in this case was due to an ulcerated condition of the projecting third lobe upon which encrusting salts were deposited.

Certainly, this is a striking instance of symptoms of irritation thought to be prostatic, but really due to stone. The obstruction remained in spite of castration, but the patient was comfortable with his catheter except when a stone was present.

Dr. White objects to my explanation of the dangers of an incomplete operation which leaves the kidneys exposed to back pressure. It seems to me that the objections urged leave the case stronger than I stated it. I mentioned one particular in which the castration somewhat resembled an incomplete stricture operation and left the kidneys disabled by back-pressure, and did not go into the matter more at length as it was somewhat aside from the line of my paper, which was already longer than I intended.

The importance of sepsis and urine absorption at the site of an incomplete stricture operation is beyond doubt, and I should not differ with Dr. White in regard to it. He, however, forgets that a closely similar condition holds in many prostatics: for the catheterization, so difficult in many cases and yet required at short intervals, almost always causes some abrasion of the succulent prostate and puts the neck of the bladder in a condition closely similar to that which exists at a stricture upon which an incomplete operation has been done. Consequently, these patients are usually suffering from the chronic sepsis due to a leakage of contaminated urine. If he is inclined to undervalue the advantages of drainage in such cases, I can only say that I cannot agree with him, and we must leave that question to be settled by accumulating experience.

The part played by back-pressure upon the kidneys seems to me much more important than it does to him, and I base my opinion upon cases of distended and spasmodic bladders in which I have seen the establishment of drainage at once followed by a largely increased flow of urine and by the disappearance of well-marked uræmic symptoms.

In regard to the question as to the changes in the prostate to which the diminution in size and the relief of obstruction are due, I say in my paper that "This question, as to the correctness of such observations as are reported by Dr. White and others, can only be settled by an accumulated mass of evidence obtained by numerous examinations of the prostates of castrated patients brought in contrast to another mass of evidence obtained by control examinations of hypertrophied prostates from non-castrated patients.

"Such an array of evidence does not yet exist, and the exact pathology of the change remains to be worked out. When this evidence has been obtained, we shall hope to understand why, in some cases, little if any diminution in the size of the gland occurs, while in others an enormous shrinkage takes place; also, why the changes appear so much more quickly in some cases than in others." I then give some impressions derived from a study of the material at hand, but do not attempt to give it more importance than that of suggestion merely. I therefore object strongly to the tone of the criticism which sets me up as giving positive opinions upon points which no one can regard as settled.

Arguments on this subject are premature, and I have no desire to prove anything from insufficient data. I refuse to discuss the subject, and leave the few observations I have recorded to have what weight they may in the furtherance of the investigation.

I am glad to see that Dr. White admits at last that changes in vascularity may play some part in the reduction of the prostate, and would remind him that no more wholly unsupported theory has been advanced in the whole discussion than his that the quick relief which sometimes follows castration is due to a rapid process of atrophy of the third lobe.

I look forward with interest to the appearance of the new table of cases collected for Dr. White and from which he estimated such a favorable death-rate (6.5 per cent.), certainly a great improvement over those already published.

A year ago, Dr. White was quite sceptical about the serious nervous symptoms reported by other surgeons as sometimes following castration. In his quite ample remarks upon my paper he does not allude to this important question. I trust that when he publishes his next paper on the subject we shall hear his present feeling in regard to this.

While apologizing to your readers for the length of this communication, I feel that it was required by the unusual position in which my paper was placed by the exhaustive editorial criticism accorded it in the same number of the ANNALS.

The presumably judicial position of an editor might well lead readers to draw their opinions from the editorial *résumé* of the question rather than from the perusal of a long paper. Even the confession of a controversial intent, made in the end of that editorial, does not wholly remove the advantage which a judge's charge might, if thus used, have over a counsel's presentation of his case.

I have therefore felt it my right to take the above exceptions to the ruling of the court, and I am now willing to leave the matter until further experience sheds new light on the question.

I have always taken the greatest interest in the facts that Dr. White has brought forward in support of the procedure in which he justly takes considerable pride. It is important, however, that in introducing and discussing so radical a measure which has shown itself to be not devoid of danger, the greatest care should be taken not to underestimate its dangers nor to overlook its limitations.

Respectfully yours,

ARTHUR TRACY CABOT.

FROM THE SURGICAL SECTION OF THE TWELFTH INTERNATIONAL MEDICAL CONGRESS IN MOSCOW.

ACTING upon the advice of Dr. E. Braatz (Königsberg), the Surgical Section of the Twelfth International Medical Congress has decided, in view of the approaching Congress, to collect international statistics on narcotizations for the current year (1896). For this purpose the managers of the said section apply to all their colleagues and earnestly request them to give answers to the following questions:

(1) Number of narcoses from January 1, 1896, to January 1, 1897?

(2) What narcotics were administered?

(3) Number of fatal cases?

The secretary of the Surgical Section, F. Rein (Moscow, Malaja Dmitrovka, house Scheschkov), will be glad to receive such information, and, if possible, not later than July 1, 1897.

The Secretary of the Surgical Section,

Dr. F. Rein.

TO CONTRIBUTORS AND SUBSCRIBERS.

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REPORT OF SIXTY-NINE CASES OF AMPUTATION AT THE HIP-JOINT BY THE AUTHOR'S METHOD.[1]

By JOHN A. WYETH, M.D.,

OF NEW YORK,

PROFESSOR OF SURGERY AT THE NEW YORK POLYCLINIC MEDICAL SCHOOL AND HOSPITAL.

THE accompanying table gives a synopsis of the histories of sixty-nine cases of amputation at the hip-joint, in which the author's method of controlling hæmorrhage was employed. Fifty-six of the patients were males and thirteen were females, of whom eleven died, a death-rate of 15.9.

Of the eleven fatal cases, five had suffered extensive injury with hæmorrhage, and were profoundly in shock from pulpefaction of one or both extremities and loss of blood.

In Dr. Baxter's case, there was pulpefaction of the right foot and leg, and of the entire left lower extremity as high as the middle of the thigh.

In Dr. Johnston's case, the lower extremity was pulpefied as high as the middle of the thigh.

In Dr. Thomas's case, the femoral artery had been divided in Scarpa's space, and the hæmorrhage had been very profuse and prostrating; gangrene had resulted.

In Dr. Strock's case, the limb was pulpefied in a railway crush as high as the upper third of the thigh.

Dr. Pinkerton's case was one of compound comminuted gunshot fracture, the patient dying of shock.

The factor in these fatal cases was hæmorrhage before operation, but none occurred during or after the procedure. In none was employed the precautionary injection into the veins of normal salt solution at 110° F., which, in my opinion, should be employed prior to operation in every case in which shock has been wholly or in good part caused by hæmorrhage.

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[1] Read before the New York Surgical Society, November 11, 1896.

Of the other fatal cases, Dr. Murdock's died from shock twenty-two hours after the operation, as there was no other possible cause of death. Dr. Pinkerton's case, of necrosis of the femur, died in shock twelve hours after the operation. There was no hæmorrhage. Dr. Gaston's case died on the twenty-sixth day after the operation from *septicæmia*. Dr. Phelps's case, of osteomyelitis, was very much exhausted from the disease and from prolonged sepsis, and died twelve hours after the operation. Dr. Walker's case was a similar one of chronic hip-disease, and the patient died four hours after the operation. Dr. Morris's case died eleven days after the operation from tubercular peritonitis, as demonstrated by the autopsy.

My own fatal case died partly from shock, yet after the operation he was in better condition than any of my other patients. Twenty-six hours later, while I was absent from the city, my assistant, for what he took to be symptoms of shock coming on, injected two pints of hot saline solution, which, in my opinion, was a fatal error. This patient had lost no blood, and it would probably have been better had some hæmorrhage occurred, as the amount of blood forced out of the limb into the trunk in a patient, otherwise plethoric, threw more work upon the heart than it could accomplish. This point of overcrowding the heart is worthy of consideration.

In the forty cases of sarcoma for which amputation was done, there were four deaths,—a mortality of 10 per cent. In the twenty-two cases of inflammatory bone-disease, there were three deaths,—13.6 per cent.

Dr. John F. Erdmann[1] says that, from January, 1884, to January, 1895 (the aseptic period), there were eighteen hip-joint amputations done in Bellevue, Roosevelt, St. Luke's, Mt. Sinai, Chambers Street, German, and Presbyterian Hospitals, in New

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[1] Annals of Surgery, September, 1895.

York City, with eight deaths, a mortality of 44.4 per cent. Of these eighteen cases, seven were operated upon by Wyeth's method and all recovered, leaving eight fatal cases in eleven amputations by other methods,—a death-rate of 72.7.

I would not imply that such a death-rate as this would follow any other method of operation, for I know that in the hands of careful and thorough operators much better results would follow. I need but cite the success of Estes, of Bethlehem, Pa., accomplished by tying all bleeding points as the dissection was carried on, of McBurney, with abdominal section and direct digital compression of the aorta, and of Tilden Brown, with his ingenious clamp. But I insist that my method of hæmostasis is so simple, so safe, and so universally applicable, that it removes from the operation every possible element of danger, as far as hæmorrhage is concerned.

An analysis of these sixty-nine cases as to the efficiency of this method of controlling hæmorrhage shows that it was perfectly satisfactory in every instance but two.

In Dr. Morris's case, the first incision in the skin demonstrated that the constriction was not tight enough. This was corrected, and the operation completed without bleeding.

In Dr. Murray's case, the pins were not of sufficient strength and yielded to the pressure, causing slight hæmorrhage.

Disarticulation at the hip-joint[1] is by far the most formidable in the list of amputations. In 1881, Professor John Ashhurst, Jr., wrote, " The removal of the lower limb at the coxo-femoral articulation may be properly regarded as the gravest operation that the surgeon is ever called upon to perform, and it is only within a comparatively recent period that it has been accepted as a justifiable procedure. The most pressing risk is that of hæmorrhage."

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[1] At Bardstown, Ky., in August, 1806, Dr. Walter Brashear amputated at the hip in a negro, seventeen years of age, on account of a severe fracture of the femur and laceration of the soft parts. A circular incision was made, the muscles divided well below the hip-joint, and the vessels secured as the operation progressed. A longitudinal incision along the outer side of the limb exposed the remainder of the bone, which, being freed from its muscular attachments, was disarticulated at the socket.—Professor D. W. Yandell, " American Practitioner and News," 1890.

Dieffenbach's name has been prominently associated with this operation among surgeons, but Dieffenbach did not take his degree in medicine until 1822, sixteen years after the pioneer Kentuckian had performed his operation, which was the first hip-joint amputation in the United States.

In 1890 I applied for the first time, and with success, in an amputation at the hip-joint, the method of controlling hæmorrhage which I had used more than a year previous in amputation at the *shoulder*. (Figs. 1 and 2.) Since that date I have performed the operation seven times, and it has been done in a number of instances by other operators. The method is as follows:

The patient should be placed with the sacrum resting upon the corner of the operating table, the sound limb and arms being wrapped with cotton batting and thoroughly protected from unnecessary loss of heat. The limb to be amputated should be emptied of blood by elevation of the foot, and by the application of the Esmarch bandage, commencing at the toes. Under certain conditions, the bandage can be only partially applied. When a tumor exists, or when septic infiltration is present, pressure should be exercised only to within five inches of the diseased portion for fear of driving the septic material into the vessels. After injuries with great destruction, crushing, or pulpefaction, one must generally trust to elevation, as the Esmarch bandage cannot always be applied. While the member is elevated and before the Esmarch bandage is removed the rubber tubing constrictor is applied. The object of this constriction is *the occlusion of every vessel above the level of the hip-joint, permitting the disarticulation to be completed and the vessels secured without hæmorrhage and before the tourniquet is removed.* To prevent any possibility of the tourniquet slipping, I employ two large steel needles or skewers, three-sixteenths of an inch in diameter and ten inches long, one of which is introduced one-fourth of an inch below the anterior superior spine of the ilium and slightly to the inner side of this prominence, and is made to traverse superficially for about three inches the muscles and fascia on the outer side of the hip, emerging on a level with the

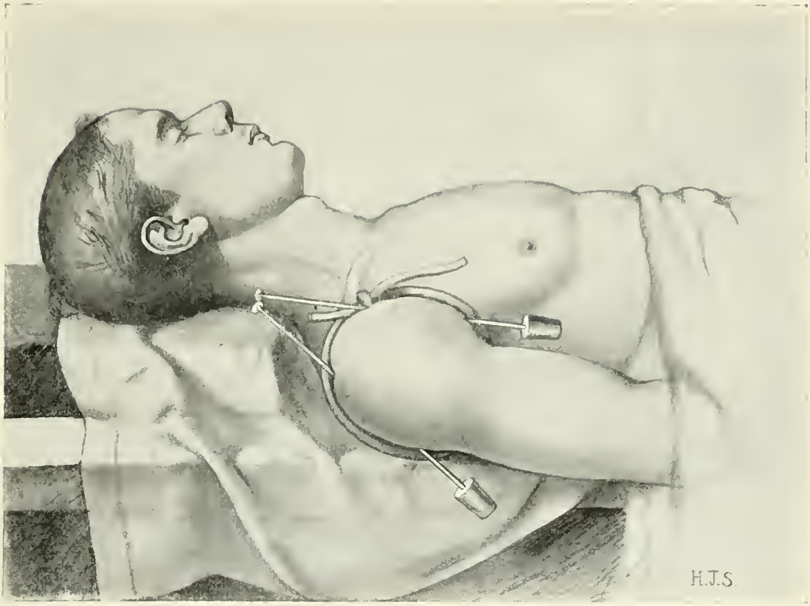

FIG. 1.—Shoulder-joint amputation. Pins and rubber-tube tourniquet in position. The Esmarch bandage has been removed. (From drawings by H. J. Shannon.)

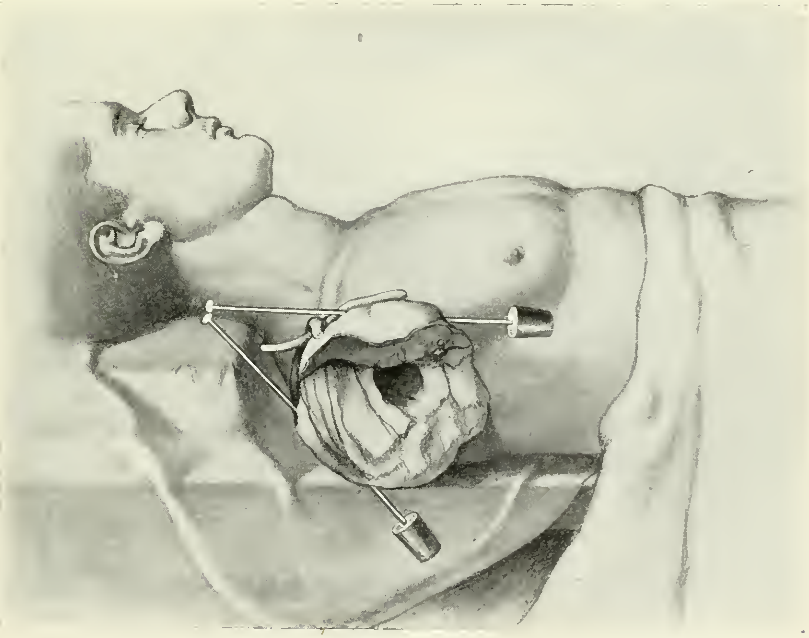

FIG. 2.—The same after disarticulation and ligature of the vessels.

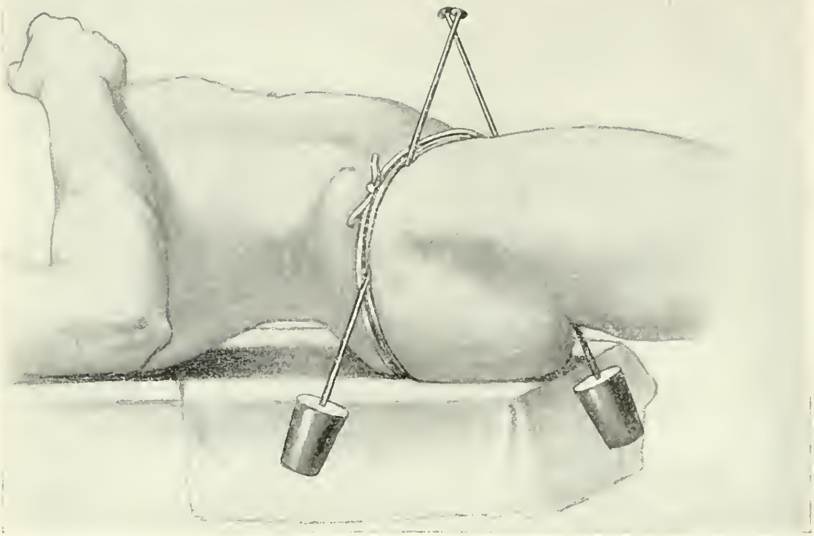

FIG. 3.—Hip-joint amputation. Pins and rubber-tube tourniquet in position. The Esmarch bandage has been removed.

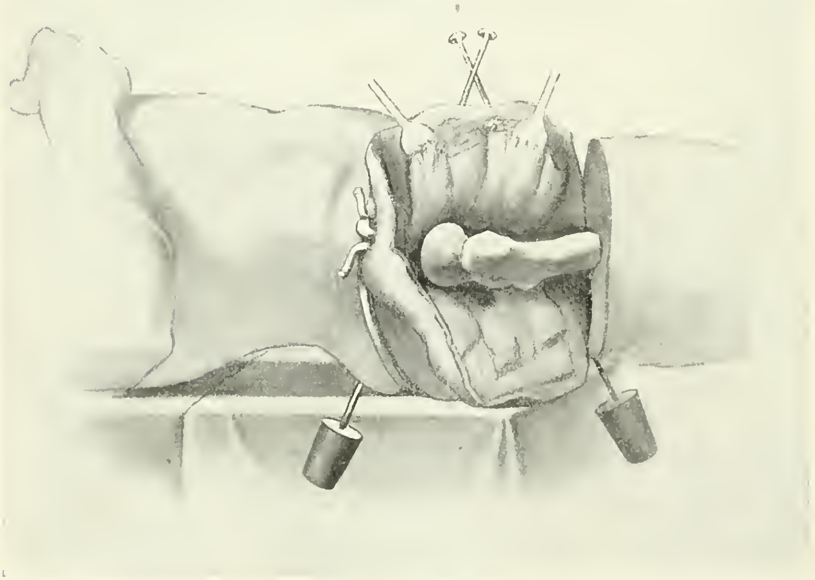

FIG. 4.—The same showing the soft parts dissected from the bone and the capsule exposed.

point of entrance. (Fig. 3.) The point of the second needle is thrust through the skin and tendon of origin of the adductor longus muscle half an inch below the crotch, the point emerging an inch below the *tuber ischii*. The points should be shielded at once with cork to prevent injury to the hands of the operator. No vessels are endangered by these skewers. A mat or compress of sterile gauze, about two inches thick and four inches square, is laid over the femoral artery and vein as they cross the brim of the pelvis; over this a piece of strong, white rubber tubing, half an inch in diameter when unstretched, and long enough when in position to go five or six times around the thigh, is now wound very tightly around and above the fixation needles and tied. If the Esmarch bandage has been employed, it is now removed. Excepting the small quantity of blood between the limit of the Esmarch bandage and the constricting tube, the extremity is bloodless, and will remain so.

In the formation of the flaps, the surgeon must be guided by the condition of the parts within the field of operation. When permissible, the following method seems ideal:

About six inches below the tourniquet a circular incision is made down to the muscles, and this is joined by a longitudinal incision commencing at the tourniquet and passing over the trochanter major. A cuff that includes everything down to the muscle is dissected off to near the level of the trochanter minor. At about this level the remaining soft parts, together with the vessels, are divided squarely down to the bone by a circular cut. At this stage of the operation the central ends of the divided superficial and deep femoral veins, as well as the arteries, are in plain view and should be tied with good-sized catgut. (Fig. 4.) This done, the disarticulation is rapidly completed by lifting the muscular insertions from the trochanters and digital fossa, keeping very close to the bone with knife or scissors, and holding the soft parts away with retractors. The capsular ligament is now exposed and divided, and by forcible elevation, adduction, and rotation of the femur, it is widely opened, the *ligamentum teres* ruptured, and the *caput femoris* dislocated. (Fig. 5.) If properly conducted up to this point, not a drop of blood has escaped, except that which was in the limb below the constrictor when this was applied. The remaining vessels which require the ligature should now be sought for and secured. There are, first, the *saphena vein*, which, on account of its proximity to the main trunk, should be tied; the *sciatic artery*, which will be found near the stump of the sciatic nerve; the *obturator*, which is situated between the stump of the adductor brevis and magnus, usually about half-way from the centre of the shaft of the femur to the inner side of the thigh, the vessel being on a level with the anterior surface of the femur; the *descending branches* of the *external circumflex*, two or three in number, usually found about an inch and a half outward and downward from the main femoral vessels beneath the rectus and in the substance of the crureus and vastus externus. The *descending branches* of the *internal circumflex* are insignificant, and are usually found on the level of the femoral vessels in the substance of the adductor longus and between it and the adductor brevis and pectineus.

In tying the larger femoral vessels, I make it a rule to dissect both the superficial and deep femoral stumps back from one-half to three-fourths of an inch, so that I can apply the ligature behind any of their branches which may have been divided close to their points of origin, and I do not hesitate to include the large veins in the same ligature in order to save time. With the vessels I have mentioned quickly secured, there is really no necessity for even temporarily loosening the tourniquet. If the operator is not sure that he has found and securely placed the ligatures upon these larger vessels, it is a simple matter to loosen slowly the grasp of the tourniquet until the pulsation of the larger trunks is perceptible. No attention should be paid to the general oozing from the large muscular surfaces which have been divided. If every oozing point were ligatured, from half an hour to an hour would be consumed in securing a dry wound in the majority of cases. In order to hasten the operation and stop the oozing, I introduce a snug packing of sterile iodoform-gauze ribbon into the cavity of the acetabulum and the space between the muscles from which the bone has been removed, leaving one end of the ribbon to pass between the flaps for the purpose of its

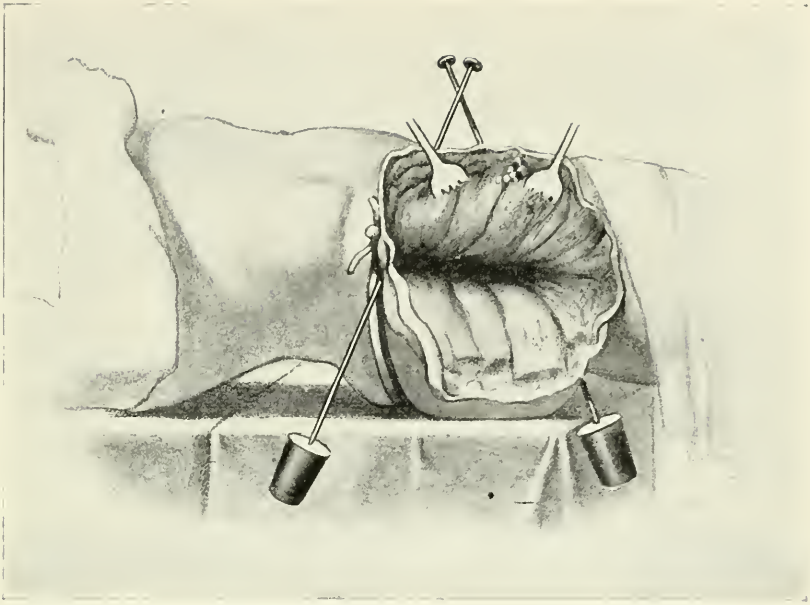

FIG. 5.—The same with the disarticulation complete. Constrictor still in position.

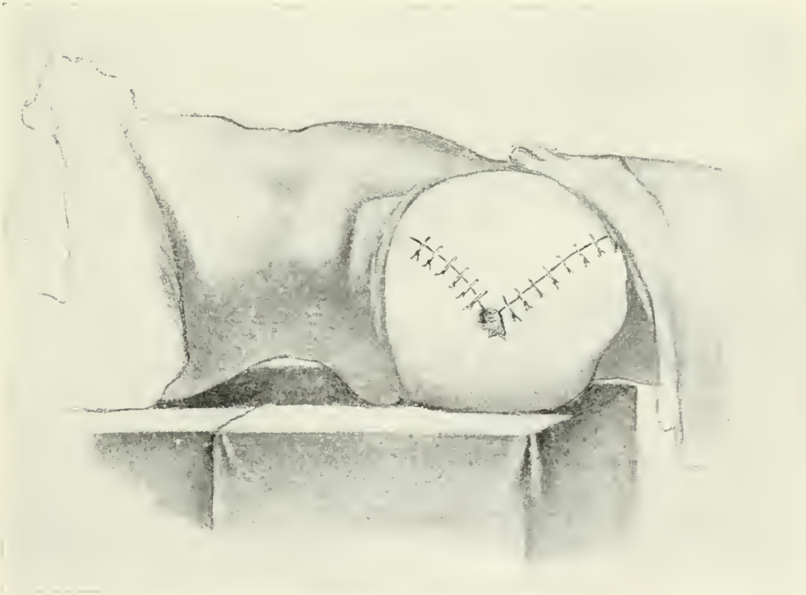

FIG. 6.—The operation completed.

removal. With a long, half-curved Hagedorn-Fowler needle, armed with good-sized catgut, deep sutures are passed through the stumps of the divided muscles in such a way that large masses of muscle are brought tightly together when these sutures are tied, taking two to four inches in the grasp of each suture. The needle is not passed in the proximity of the large vessels or the sciatic nerve, but in all other directions the muscles are rapidly quilted together. This effectively and rapidly controls all oozing. Nothing remains but to close the flap with silkworm-gut sutures, and cleanse it off thoroughly dry, seal it with collodion in its entire extent to prevent any infection from the genital or anal region, apply a large, loose dressing of iodoform and then sterile gauze, and a light bandage over the first light dressing. The pins are then removed and the remainder of the dressing completed. Preliminary pressure of the light dressing prevents oozing and the wound remains dry. (Fig. 6.)

When, from destruction of the parts by accident or disease, or by the proximity of a neoplasm, this ideal method is not practicable, any modification may be employed, preference being given to the incision which keeps farthest from the tumor and gives the healthiest flaps. When there is not sufficient material to cover the stump, it is even safer to err on the side of an unclosed wound and trust to granulation or grafting for ultimate closure.

In the first two operations I did. I divided the femur on a line with the incision through the muscles, tying the vessels, removing the tourniquet, and then dissecting out the upper fragment of the femur. I found it exceedingly difficult to disarticulate the head of the bone, and, at the suggestion of the late Dr. J. B. Murdock, of Pittsburg, Pa., who witnessed the operation, I have since left the femur intact in order to facilitate the disarticulation.

In regard to the steel pins, Professor John B. Deaver, of Philadelphia, has held the rubber tourniquet in place without them, substituting a tight strip of roller bandage underneath the tube in front and behind, an assistant making strong traction upward. Dr. Emory Lanphear, of St. Louis, Mo., succeeded in doing the operation with only one, the outer pin in position. The fixation pins are not expensive, can easily be obtained in any part of the country, and obviate every risk of hæmorrhage. I see no reason for failing to employ them as directed.

TABULATED STATEMENT OF CASES OF HIP-JOINT AMPUTATION BY WYETH'S METHOD.

CASE 1. *Operator*, John A. Wyeth, New York; *Date*, February, 1890; *Age*, thirty-nine years; *Sex*, male; *Diagnosis*, osteosarcoma; *Result*, recovered. *Remarks:* At first operation femur was divided at level of lesser trochanter; sixteen days later, head of the bone was enucleated.

CASE 2. *Operator*, John A. Wyeth, New York; *Date*, February, 1890; *Age*, thirty-four years; *Sex*, male; *Diagnosis*, neurosarcoma of internal popliteal nerve; *Result*, recovered. *Remarks:* The tumor of the nerve was extirpated February, 1888; recurred, and limb was amputated at lower third of thigh, October, 1888; recurred again, and amputation at hip-joint was performed.

CASE 3. *Operator*, John A. Wyeth, New York; *Date*, 1892; *Age*, seventeen years; *Sex*, female; *Diagnosis*, osteosarcoma of lower end of femur; amputation and recurrence in stump; *Result*, recovered. *Remarks:* Amputation through lower third of femur had been performed by Dr. Allen, of Cleveland, February, 1892.

CASE 4. *Operator*, John A. Wyeth, New York; *Date*, November, 1893; *Age*, twenty-eight years; *Sex*, male; *Diagnosis*, chronic hip-joint disease; *Result*, recovered. *Remarks:* The femur was so firmly ankylosed to the ilium that force could not break them apart, requiring a chisel and hammer to effect separation.

CASE 5. *Operator*, John A. Wyeth, New York; *Date*, August, 1894; *Sex*, male; *Diagnosis*, sarcoma of lower third of femur; *Result*, died. *Remarks:* Rallied well from operation, but twenty-six hours after his pulse became rapid and weak, suggesting shock; the surgeon in whose charge I had left the case injected two pints of hot saline solution, but the patient died forty hours after operation.

CASE 6. *Operator*, John A. Wyeth, New York; *Date*, October, 1895; *Age*, twenty years; *Sex*, male; *Diagnosis*, osteosarcoma of femur; *Result*, recovered. *Remarks:* No hæmorrhage; discharged cured.

CASE 7. *Operator*, John A. Wyeth, New York; operation by J. A. Bodine; *Date*, July, 1895; *Age*, eighteen years; *Sex*, male; *Diagnosis*, osteosarcoma of femur; *Result*, recovered. *Remarks:* No hæmorrhage; nothing of special interest.

CASE 8. *Operator*, Samuel H. Pinkerton; *Date*, 1892; *Age*, seventeen years; *Sex*, male; *Diagnosis*, tuberculous ostitis of femur; *Result*, recovered.

CASE 9. *Operator*, Samuel H. Pinkerton, Salt Lake City; *Date*, 1892; *Age*, ten years; *Sex*, male; *Diagnosis*, tuberculous ostitis of femur; *Result*, recovered.

CASE 10. *Operator*, Samuel H. Pinkerton, Salt Lake City; *Date*, 1892; *Age*, forty-two years; *Sex*, male; *Diagnosis*, extensive necrosis of femur; *Result*, recovered.

CASE 11. *Operator*, Samuel H. Pinkerton, Salt Lake City; *Date*, 1892; *Age*, forty-three years; *Sex*, male; *Diagnosis*, extensive necrosis of femur; *Result*, died. *Remarks:* Death twelve hours after operation from shock; no hæmorrhage.

CASE 12. *Operator*, Samuel H. Pinkerton; *Date*, 1892; *Age*, seventeen years; *Sex*, male; *Diagnosis*, ostitis of femur; *Result*, recovered.

CASE 13. *Operator*, Samuel H. Pinkerton; *Date*, 1892; *Age*, six years; *Sex*, male; *Diagnosis*, compound comminuted gunshot fracture of femur; *Result*, died. *Remarks:* Two hours after operation, death from shock.

CASE 14. *Operator*, A. M. Phelps, New York City; *Date*, December, 1891; *Sex*, male; *Diagnosis*, long-standing, destructive osteoarthritis; *Result*, recovered.

CASE 15. *Operator*, A. M. Phelps; *Date*, 1892; *Sex*, male; *Diagnosis*, osteomyelitis of entire femur; *Result*, died. *Remarks:* Death from exhaustion twelve hours after operation; condition of patient so bad that operation contra-advised, but performed at urgent request of parents.

CASE 16. *Operator*, A. M. Phelps; *Date*, 1891; *Age*, fifty-five years; *Sex*, male; *Diagnosis*, osteosarcoma; *Result*, recovered.

CASE 17. *Operator*, A. M. Phelps; *Date*, 1895; *Age*, sixteen years; *Sex*, male; *Diagnosis*, osteosarcoma of knee; *Result*, recovered.

CASE 18. *Operator*, A. M. Phelps; *Age*, eleven years; *Sex*, male; *Diagnosis*, osteomyelitis; *Result*, recovered.

CASE 19. *Operator*, Emory Lanphear; *Date*, 1890; *Age*, nine years; *Sex*, male; *Diagnosis*, osteomyelitis of femur; *Result*, recovered. *Remarks:* "Wyeth's bloodless method, by which failure to control hæmorrhage seems to me to be impossible."

CASE 20. *Operator*, Emory Lanphear; *Date*, 1892; *Age*, fifteen years; *Sex*, male; *Diagnosis*, osteomyelitis of femur; *Result*, recovered.

CASE 21. *Operator*, Emory Lanphear; *Date*, 1893; *Age*, twenty-eight years; *Sex*, male; *Diagnosis*, osteomyelitis of femur; *Result*, recovered.

CASE 22. *Operator*, Emory Lanphear; *Date*, 1892; *Age*, twenty-eight years; *Sex*, female; *Diagnosis*, osteoma of femur penetrating sciatic nerve; *Result*, recovered.

CASE 23. *Operator*, H. O. Walker; *Date*, 1892; *Age*, fourteen years; *Sex*, male; *Diagnosis*, osteosarcoma; *Result*, recovered. *Remarks:* "We have in this a safe and reliable method for controlling hæmorrhage, which, in my judgment, is superior to any yet offered."

CASE 24. *Operator*, H. O. Walker; *Date*, 1893; *Age*, twenty-one years; *Sex*, male; *Diagnosis*, chronic hip-joint disease; *Result*, recovered.

CASE 25. *Operator*, H. O. Walker; *Date*, 1893; young man; *Diagnosis*, chronic hip-joint disease; *Result*, died. *Remarks:* Death from exhaustion in four hours; no hæmorrhage.

CASE 26. *Operator*, C. B. Nancrede; *Date*, November, 1892; *Age*, thirty-two years; *Sex*, male; *Diagnosis*, osteosarcoma; *Result*, recovered.

CASE 27. *Operator*, C. B. Nancrede; *Date*, 1893; *Age*, thirty-one years; *Sex*, male; *Diagnosis*, osteomyelitis of femur; *Result*, recovered.

CASE 28. *Operator*, John B. Deaver; *Date*, 1890; *Age*, twenty years; *Sex*, female; *Diagnosis*, chronic osteoarthritis; *Result*, recovered.

CASE 29. *Operator*, John B. Deaver; *Date*, 1893; *Age*, twenty years; *Sex*, male; *Diagnosis*, osteomyelitis of femur; *Result*, recovered.

CASE 30. *Operator*, J. Ewing Mears; *Date*, 1892; *Age*, ten years; *Sex*, male; *Diagnosis*, chronic osteoarthritis of hip; *Result*, recovered.

CASE 31. *Operator*, A. E. Mallock; *Date*, 1892; *Age*, thirty years; *Sex*, male; *Diagnosis*, chronic osteoarthritis of hip; *Result*, recovered. *Remarks:* Operation lasted thirty-five minutes.

CASE 32. *Operator*, R. L. Swan; *Date*, 1892; *Age*, nineteen years; *Sex*, female; *Diagnosis*, chronic osteoarthritis of hip; *Result*, recovered.

CASE 33. *Operator*, G. A. Baxter; *Date*, 1891; *Age*, seventeen years; *Sex*, male; *Diagnosis*, railroad pulpefaction of right foot, leg, and left lower extremity as high as middle of thigh; *Result*, died. *Remarks:* Patient rallied well; four hours later raised himself in bed to reach a glass of water, and instantly expired; no bleeding after operation.

CASE 34. *Operator*, W. B. Johnston; *Date*, 1892; *Age*, thirty-nine years; *Sex*, male; *Diagnosis*, railroad pulpefaction of lower extremity as high as middle of thigh; *Result*, died. *Remarks:* Death ninety hours after operation from shock and exhaustion. "There was not one drop of arterial blood and only a slight venous oozing from the muscular tissue."

CASE 35. *Operator*, J. D. Thomas; *Date*, 1891; *Age*, eighteen years; *Sex*, male; *Diagnosis*, femoral vessels divided in Scarpa's triangle by red-hot bar of iron; impending gangrene; *Result*, died. *Remarks:* Great hæmorrhage from the accident. On seventh day after injury, amputation; death thirty-six hours later; no bleeding after operation.

CASE 36. *Operator*, William F. Fluhrer; *Date*, May, 1890; *Age*, eighteen years; *Sex*, female; *Diagnosis*, osteosarcoma of femur; *Result*, recovered. *Remarks:* Spontaneous fracture at middle of thigh, April 26, 1890. "As little blood was lost as in an ordinary amputation at the middle of the thigh."

CASE 37. *Operator*, Charles McBurney; *Date*, May, 1890; *Age*, thirty-four years; *Sex*, male; *Diagnosis*, osteosarcoma; *Result*, recovered. *Remarks:* "No other appliance that has been suggested for the purpose could in any way compare in utility with that of Dr. Wyeth."

CASE 38. *Operator*, Frank Hartley; *Date*, March, 1892; *Age*, twenty-six; *Sex*, female; *Diagnosis*, osteosarcoma; *Result*, recovered.

CASE 39. *Operator*, Merrill Ricketts; *Date*, February, 1893; *Age*, twenty-three; *Sex*, female; *Diagnosis*, osteosarcoma; *Result*, recovered. *Remarks:* "The operation was entirely bloodless."

CASE 40. *Operator*, C. A. White; *Date*, May, 1891; *Age*, twenty-three years; *Sex*, male; *Diagnosis*, osteosarcoma; *Result*, recovered. *Remarks:* Patient was up and about after operation, but on the twenty-seventh day was seized with pneumonia and died five days later.

CASE 41. *Operator*, W. W. Keen; *Date*, January, 1892; *Age*, thirty years; *Sex*, female; *Diagnosis*, osteosarcoma; *Result*, recovered. *Remarks:* Patient was five months pregnant at time of operation. "It was reserved for an American surgeon to devise what is undoubtedly the best method, and, in fact, what I think we can now call the only method of hæmostasis in amputation at the hip-joint."

CASE 42. *Operator*, M. J. Ahern; *Date*, 1892; *Age*, twenty-two years; *Sex*, male; *Diagnosis*, osteosarcoma; *Result*, recovered.

CASE 43. *Operator*, J. B. Murdock; *Date*, February, 1892; *Age*, seventeen years; *Sex*, male; *Diagnosis*, osteosarcoma; *Result*, died. *Remarks:* Death from shock twenty-two hours after operation. "I believe this method to be the best and the one destined to supersede all other methods for the temporary arrest of hæmorrhage."

CASE 44. *Operator*, J. McFadden Gaston; *Date*, November, 1890; *Sex*, male; *Diagnosis*, osteosarcoma; *Result*, died. *Remarks:* Death on twenty-sixth day from septicæmia. "There was absolutely no trouble from hæmorrhage, and I feel satisfied that with this process all bleeding may be prevented in amputation at the hip-joint."

CASE 45. *Operator*, A. J. McCosh; *Date*, 1892; *Age*, twenty-seven years; *Sex*, male; *Diagnosis*, osteosarcoma; *Result*, recovered.

CASE 46. *Operator*, F. W. Parham; *Date*, October, 1893; *Age*, three years; *Sex*, male; *Diagnosis*, osteosarcoma; *Result*, recovered.

CASE 47. *Operator*, J. M. Holloway; *Date*, November, 1892; *Age*, twenty-seven years; *Sex*, male; *Diagnosis*, osteosarcoma; *Result*, recovered. *Remarks:* Patient was discharged from hospital on the tenth and went to his home, a distance of seventy miles, on the twelfth day.

CASE 48. *Operator*, R. T. Morris, Texas; *Date*, April, 1894; *Age*, nineteen years; *Sex*, male; *Diagnosis*, "tumor" of thigh; *Result*, died. *Remarks:* Died eleven days after operation from tubercular peritonitis. Cause of death proved by autopsy. "While making the skin incisions, it was noticed that the limb was not completely exsanguinated, and the tourniquet was retightened, after which no bleeding resulted."

CASE 49. *Operator*, H. H. Vinke; *Date*, August, 1894; *Age*, sixteen years; *Sex*, female; *Diagnosis*, sarcoma of thigh; *Result*, recovered. *Remarks:* Used crutches in seven weeks. "Absolutely no loss of blood. There is probably no method which commends itself for simplicity and effectiveness so much as Wyeth's."

CASE 50. *Operator*, J. S. Horsley; *Date*, October, 1894; *Age*, thirty-six years; *Sex*, male, negro; *Diagnosis*, recurring sarcoma of femur; *Result*, recovered. *Remarks:* "No more blood was lost than in an amputation through the thigh. It remained for Dr. Wyeth to so perfect this method as to make amputation practically a bloodless operation."

CASE 51. *Operator*, George W. Miel; *Date*, November, 1894; *Age*, forty-one years; *Sex*, male; *Diagnosis*, osteosarcoma of thigh; *Result*, recovered. *Remarks:* "A very satisfactory means of controlling hæmorrhage."

CASE 52. *Operator*, F. Tilden Brown; *Date*, December, 1894; *Age*, twenty-two years; *Sex*, male; *Diagnosis*, osteosarcoma of triceps femoris; *Result*, recovered. *Remarks:* "Hæmostatic effect all that could be desired."

CASE 53. *Operator*, S. B. Fowler; *Date*, 1890; *Age*, fifty-four; *Sex*, male; *Diagnosis*, traumatic osteitis of femur; bed-ridden for fifteen years; *Result*, recovered. *Remarks:* Recovery without suppuration; no hæmorrhage; patient now living (1896).

CASE 54. *Operator*, Robert Weir; *Date*, January, 1895; *Sex*, male; *Diagnosis*, sarcoma of femur; *Result*, recovered. *Remarks:* No recurrence up to February, 1896.

CASE 55. *Operator*, F. W. Murray; *Date*, June, 1894; *Age*, eighteen years; *Sex*, male; *Diagnosis*, sarcoma of femur; *Result*, recovered. *Remarks:* Pins were by mistake too small; they bent and caused slight hæmorrhage.

CASE 56. *Operator*, C. K. Briddon; *Date*, June, 1894; *Age*, twenty-three years; *Sex*, male; *Diagnosis*, sarcoma of femur; *Result*, recovered. *Remarks:* "So little blood was lost that the patient suffered scarcely at all from shock."

CASE 57. *Operator*, W. T. Bull; *Date*, May, 1895; *Age*, five years; *Sex*, female; *Diagnosis*, osteosarcoma of femur; *Result*, recovered. *Remarks:* Primary union; time of operation, forty minutes.

CASE 58. *Operator*, Thomas R. Wright; *Date*, 1895; *Sex*, male; *Diagnosis*, sarcoma of knee; *Result*, recovered.

CASE 59. *Operator*, Thomas R. Wright; *Date*, July, 1896; *Age*, fifty years; *Sex*, male, negro; *Diagnosis*, sarcoma of knee; *Result*, recovered. *Remarks:* Lost comparatively no blood. Temperature 103° F. and pulse 120 before operation.

CASE 60. *Operator*, A. Schachner; *Age*, fifty-five years; *Sex*, male; *Diagnosis*, fracture of femur; gangrene; *Result*, recovered. *Remarks:* First dressing six days after operation.

CASE 61. *Operator*, H. H. Grant; *Age*, thirty-three years; *Sex*, female; *Diagnosis*, chondroma with sarcomatous degeneration; *Result*, recovered. *Remarks:* Enormous chondroma with sarcomatous degeneration; tumor weighed sixty-five pounds when removed. Operation lasted thirty-five minutes; bloodless except for some oozing. "Method leaves nothing to be desired."

CASE 62. *Operator*, Daniel Strock; *Date*, 1894; *Age*, thirty-five years; *Sex*, male; *Diagnosis*, limb pulpefied; *Result*, died. *Remarks:* Railway crush; including upper third of thigh. Hæmorrhage entirely controlled. Patient died of shock. Patient bled profusely before admission to hospital.

CASE 63. *Operator*, W. R. Stewart; *Date*, 1895; *Age*, thirty-five years; *Sex*, male; *Diagnosis*, sarcoma; *Result*, recovered. *Remarks:* Was well November 19, 1896.

CASE 64. *Operator*, Eugene Boise; *Date*, 1895; *Age*, twenty-one years; *Sex*, female; *Diagnosis*, sarcoma; *Result*, recovered. *Remarks:* No loss of blood. Vessels nearly all tied before tubing was removed. "Method of amputation is all that could be desired."

CASE 65. *Operator*, D. C. Hawley; *Date*, 1896; *Age*, twenty-one years; *Sex*, male; *Diagnosis*, sarcoma, left femur extending to within four inches of trochanter; *Result*, recovered. *Remarks:* No blood was lost. Patient in bad condition at time of operation; fracture of femur had occurred before amputation. "Control of hæmorrhage perfect."

CASE 66. *Operator*, L. L. Shropshire; *Date*, 1895; *Age*, twenty years; *Sex*, male, negro; *Diagnosis*, sarcoma, lower middle third of left thigh; *Result*, recovered. *Remarks:* Operation done in thirty minutes. Not over one ounce of blood was lost. Patient left hospital in two weeks; living and well October, 1896.

CASE 67. *Operator*, Howard Lilienthal; *Date*, 1896; *Age*, sixteen years; *Sex*, male; *Diagnosis*, chondrosarcoma from trochanter down; *Result*, recovered. *Remarks:* "Your method was employed to my great satisfaction."

CASE 68. *Operator*, W. W. Van Arsdale; *Date*, 1896; *Age*, thirteen years; *Sex*, male; *Diagnosis*, osteomyelitis; *Result*, recovered. *Remarks:* Destruction of soft parts of thigh with suppurative infection; patient was extremely septic.

CASE 69. *Operator*, J. D. Rushmore; *Date*, 1896; *Age*, fourteen years; *Sex*, female; *Diagnosis*, sarcoma of femur; *Result*, recovered.

AIR-DISTENTION OF THE BLADDER IN SUPRAPUBIC CYSTOTOMY.[1]

By F. TILDEN BROWN, M.D.,

OF NEW YORK CITY,

SURGEON TO TRINITY HOSPITAL; ASSISTANT SURGEON TO THE PRESBYTERIAN HOSPITAL.

WHEN, three years ago, I found that a pocket bicycle air-pump was a convenient agent for distending the bladder and facilitating cystotomy, and because I had so long seen introduced, often with labor, the disagreeable, if not dangerous, Petersen rectal bag, I was induced to trespass upon the courtesy and time of the surgeons of New York City in an effort to learn, by correspondence, their individual preferences in the technique of this particular feature of epicystotomy, with the following inquiry:

"In suprapubic cystotomy do you prefer air or water for distending the bladder? Do you use the Petersen rectal bag, or do you ignore all artificial distention of the bladder and rectum, and rely wholly upon Trendelenburg's position to elevate the peritoneum?"

By inference from their writings I believed that air-distention would find at least one advocate in Brooklyn and one in Philadelphia, consequently, to learn their up-to-date estimates of this agent for the specific purpose, I addressed the same question to these gentlemen.

In tabulated form the answers were approximately as follows:

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[1] Read before the New York Surgical Society, November 25, 1896.

1. The number using Trendelenburg's position only	1
2. The number inclined to operate without any artificial aid	3
3. The number using only air-distention of the bladder	3
4. The number who never use Trendelenburg's position, but use some other aids	4
5. The number who use Trendelenburg's position or some modification of it in addition to using some other artificial aids	12
6. The number who never use Petersen's rectal bag, but do use some other artificial aid	10
7. The number who use Petersen's bag in conjunction with fluid distention of the bladder	14
8. The number who use water rather than air for vesical distention with or without other aids	23

By reading several letters of these eight classifications, I will record the details of the prevailing fashions better than by the above table alone. But first permit me to take this favorable opportunity to heartily thank my correspondents for the kind reception accorded my letter and for the detailed completeness with which it was answered.

Answer No. 1.—"I rely wholly upon Trendelenburg's posture, and care nothing for the bag, water, or gas. I think they are more of a hinderance than advantage."

Answer No. 2.—"I have never used air to distend the bladder, and only occasionally water. During the last two or three years I have also given up the use of the rectal bag. Nor have I had occasion to use Trendelenburg's posture. I have never had any difficulty in reaching the bladder promptly and safely in the ordinary posture and without artificial distention by simply keeping close to the symphysis, running down close behind it if the bladder is not distended."

Answer No. 3.—"In suprapubic cystotomy I never depend upon air for distention. I usually, after washing the bladder thoroughly, inject about eight ounces of a bland solution, like Thiersch's, or normal salt solution. I have not used Petersen's bag for years, and regard it as rather a nuisance, certainly entirely unnecessary. I do *not* employ Trendelenburg's position, and do not care much whether the bladder is distended or not. A few ounces of fluid in the bladder, from six to ten, facilitate the operation somewhat.

"In regard to the peritoneum, I never open the bladder until I have identified the peritoneal fold, and also recognized the bare muscular fibre of the bladder. This can be done even when the bladder is quite empty."

Answer No. 4.—"I have inflated the bladder with air in a number of suprapubic cystotomies and always with great advantage. Professors Brinton, Hearn, Horwitz, and others, at the Jefferson, have followed the suggestion also, and I think it has become almost, one might say, our practice at the Jefferson to distend with air rather than with water. You may remember that some years ago I suggested the use of filtered air (filtered through cotton) to determine whether a bladder was ruptured or not. This is in the same line as Bristow's later suggestion."

Answer No. 5.—"I have repeatedly used air insufflation of the bladder as a preliminary to suprapubic section since that date, September, 1893, and in each case have been as well pleased as in the first case. In my own experience I have as yet not found any disadvantages in its use. It does away with the rectal colpeurynter, brings the bladder up above the pubis well, and avoids the inundation of the wound with fluid which attends the opening of a bladder distended with water."

Answer No. 6.—"I prefer Keen's suggestion, of injecting air instead of water into the bladder prior to cystotomy. The latter by its weight tends to drag the bladder down. Keen's estimate is an ounce of air to each squeeze of the bulb of a Davidson's syringe. However, I go by the *feel:* inject until one feels a gentle sense of resistance.

"I use Trendelenburg's posture and also Petersen's rectal bag, —or, in a child, the largest size of Barnes's dilator.

"In the *adult*, if no dilatation of the bladder exists, I inject what I estimate to be 250 cubic centimetres of water or air, or *half* its normal capacity; and considerably *more* than this—say 350 cubic centimetres—in the rectal bag. Of course, however, if one uses *air* in the bladder, then, as stated, this does away, in a measure, with exact estimation.

"With Trendelenburg's posture, and bladder distention, a good many men are now dropping the use of the rectal bag, I find. However, if you have one, I should advise its use, as one more means of making *certain* of abundant space above the pubes in which to work safely.

"Although you do not ask it, let me add a word about the *after*-treatment, which I think is more important, maybe, than the operation itself; which is one of the easiest we ever do.

"I use one-grain tablet triturates of saccharine and soda—say ten or fifteen grains a day—before and *after* the operation for some days. It is an excellent means of restoring the normal acidity of the urine, and preventing fermentative changes in it.

"I regularly advise, in *children*, keeping them on the *face*, so as to drain continually into a thick gauze dressing, changed as often as wet. As soon as granulations appear (five to seven days), let them run around. This is simplicity itself, and very successful and safe (2-per-cent. mortality).

"I have learned to distrust syphonage in all its forms; and in adults I put in a Trendelenburg T-tube, with a single stitch at either end of the bladder wound, to prevent its slipping out of the viscus; and pack the superficial wound with iodoform gauze. Now, once each hour, day and night, a soft rubber catheter is run down the long arm of the T to the bottom of the bladder, and the urine removed by a small glass syringe. A *slight* amount of opiates prevents spasmodic attempts to urinate during this period. In the day-time the patient amuses himself by doing this. At night the nurse does it, and without waking him at all thereby.

"A few times daily, at first, I wash out with Thiersch's solution by the same means. The T-tube is removed as soon as the urine becomes clear, or as soon as granulations appear,—say a week or ten days."

Answer No. 7.—"*Water*, never over eight ounces in bladder; and eight or ten ounces in rectum. The bag in rectum will lift the floor of the bladder one to one and a half inches and make it more accessible to sight and touch. To what extent Trendelenburg will do to replace this I can't say. I think it is a decided *advantage* to moderately fill (not distend) the bladder, though not necessary,—the peritoneum can be avoided without it. I see no objection to the use of air except that it interferes with one point in the demonstration of the full bladder,—viz., the dull percussion note."

Answer No. 8.—"I have used the Petersen bag in most of my operations, and the Thiersch solution in the bladder,—never air-inflation.

"I think both aid in making the operation easier for amateurs, but not for one of any experience.

"The Petersen rectal bag I have lately thought was objectionable by blocking the pelvis and damming the iliac veins, thus engorging the prevesical plexus, which, of course, is easily lifted away if one understands, but bleeds badly if wounded.

"The bladder distention is, I believe, of unquestionable advantage."

Answer No. 9.—"Sometimes I use Petersen bag,—sometimes not,—the less the more I operate. I have never distended with air. I have several times cut dry. I prefer a small amount of liquid. I do not always use Trendelenburg's position."

Answer No. 10.—"(1) I use weak (25 per cent.) Thiersch's solution for the bladder distention.

"(2) I have previously employed the rectal bag, but lately have found it unnecessary. It could be inserted after the bladder was exposed if it should be found to lie too low down in spite of the Trendelenburg position, which I always use."

Answer No. 11.—"(1) Prefer water distention to air distention, but do not use distention in every case, in fact, use it in less than one-half of all cases.

"(2) Petersen's rectal bag is also used as an exception rather than otherwise.

"(3) Don't use Trendelenburg's position except where the *inspection* of the interior of bladder is demanded. Peritoneum is always gotten out of the way by identification and drawing aside upward from line of section. In very fat subjects this is very much easier in Trendelenburg's position than otherwise.

"Altogether, every one of the expedients, 1, 2, and 3, is employed on clear indication only and not as a matter of mechanical routine, as each of the measures, 1, 2, and 3, may cause serious complications."

Answer No. 12.—"I prefer an antiseptic fluid for distending the bladder.

"Sometimes use the rectal bag and sometimes I do not,—it depends upon the case.

"Trendelenburg's position does not always bring the base of the bladder well up into easy operating distance, if a neoplasm of prostate is the objective. For stone it answers sufficiently."

Answer No. 13.—"In suprapubic cystotomy I always distend the bladder with water and do not employ a rectal bag. I also invariably operate in Trendelenburg's posture."

Answer No. 14.—"For suprapubic cystotomy I prefer water for distending the bladder. I have always used Petersen's bag, excepting in one case.

"I do not ignore all artificial distention. At present my method is to distend the bladder with water and operate with the patient in Trendelenburg's position. I can readily understand that the bladder can be opened with no artificial distention, relying on Trendelenburg's position, but, in my opinion, the operation is facilitated and the danger of wounding the peritoneum lessened by distending the bladder and putting the patient in Trendelenburg's position."

Answer No. 15.—"It is difficult to answer the questions categorically, because each case usually presents features peculiar to itself, which indicates different methods.

"I have done epicystotomy without distention of either rectum or bladder; but generally I prefer, in the healthy young male, a rectal bag, and water in the bladder, with but a very slight elevation of pelvis by Trendelenburg. But such cases are rarely the ones requiring operation. In old men, where there is danger of weakness of the bladder wall, I use the rectal bag, but little bladder distention. In children no rectal distention at all, and very moderate amount of fluid in bladder. In girls (for large stone) I have had difficulty in retaining fluid in the bladder. My reason for preferring distention of bladder and rectum, when it can safely be done, is because, having once seen the peritoneal cavity opened when posture alone was used, I am fearful of its happening to me. I have never used air myself, though I have assisted at operations where it was used. It seems to me that the distention cannot be so accurately measured with air as with water, owing to its expansion with warmth."

Answer No. 16.—"In epicystotomy I use (1) rectal distention with double fiddle-shaped Barnes's dilator; (2) bladder distention,—both with water; (3) hips raised with a large sand-bag, so getting a modified Trendelenburg action."

Answer No. 17.—"I have employed only water thus far, and it has served the purpose so well that I have not cared to use any other agent.

"Commonly employ a 'Petersen,' but have used the ordinary colpeurynter. Cannot advise the ignoring of all distention and the reliance on Trendelenburg, as I do not regard it to be a wise substitute for the former measure."

Answer No. 18.—"I do not use the Petersen bag in the rectum, believing the distention of rectum induces tenesmus (vesical) and pain after operation; and, besides, I doubt if it elevates the peritoneum any. I inject into the bladder about ten or twelve fluidounces of boric acid solution. The objection to air is that one does not know how much the bladder is distended; and one does not have the knowledge and control that attends the use of so many ounces of water."

Answer No. 19.—"I use fluid distention of the bladder and the rectal bag, as a rule, although with children on two occasions I have relied upon the position alone."

Answer No. 20.—"In performing suprapubic cystotomy, I have always been in the habit of using water to distend the bladder, but am at present very favorably inclined towards the use of air for this purpose. The only advantage in using water is that you are able to tell definitely just how much is in the bladder. I usually use the Petersen bag and do not use Trendelenburg's position unless operating on the bladder itself, when I find it extremely useful, but unnecessary in operating for stone or simple drainage."

Answer No. 21.—"I have not been well satisfied with air, but have used it only once. The difficulty in this case was that it was almost impossible to prevent escape, but this may have been due to improper technique. Except in this case, I have usually employed water, often, however, not filling the bladder until the incision reaches and exposes the peritoneum. This enables us to use much less water, and so obviate the possible danger of rupture in bladders with weak and thin walls. I employ the rectal bag in the same way as the water in the bladder, putting it in position, but not filling it until the necessity arises of bringing the bladder wall into view. If this is accomplished by the bladder inflation alone, the rectal bag is not employed. Of course, where Trendelenburg's position has been employed, the rectal bag is not necessary; but once or twice I have found it convenient to have a little water in the bladder. The last two or three cases I have done have been in this last position, and then having two or three ounces of water, just enough to spread the bladder walls slightly apart, run into the bladder as soon as it is necessary to recognize it in the wound. In my opinion this distention of the bladder under the eye of the operator is a great aid."

Answer No. 22.—"(1) I distend the bladder with water. (2) I *never* use Petersen's bag. (3) For convenience' sake I distend the bladder to some extent with water, but would, if necessary, wholly rely upon Trendelenburg's posture to avoid the peritoneum."

The three points of most note in the preceding letters are:

(1) That a very few of our surgeons desire and ordinarily use no postural or artificial distention of the viscera in guarding the peritoneum or exposing the bladder.

(2) That the great majority ordinarily use some postural or artificial distention or both.

(3) That so small a proportion of the just preceding class have used air for distention or see any advantage in using it. Only one New York surgeon responds as in favor of air; but this may have been theoretical, because the letter goes on to detail his technique with Petersen's bag and fluid in the bladder.

During 1895, here in New York, it was then [as regards this detail in the prevailing method of suprapubic cystotomy] what it had practically been since the papers of Garson[1] and Petersen[2] had made clear the behavior of the prevesical peritoneal fold under the influence of fluid distention of the bladder, in conjunction with distention of the rectum. In this same line of successful demonstration must be mentioned Pirogoff,[3] Braune,[4] Rüdinger,[5] Berry Hart,[6] Symington,[7] Fehleisen,[8] Strong,[9] Delbet,[10] and by a different method Trendelenburg,[11] and Bristow.[12]

To the invaluable contributions of several of the authors mentioned is due mainly our present knowledge of the anatomical relationship of the pelvic viscera and to others of them the demonstration of the comparative safety, by the Petersen method, of performing the operation, which, since the time of Frére Côme, had been steadily losing its then relative popularity.

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[1] Garson, "Die Dislocation der Harnblase und des Peritoneum bei Ausdehnung des Rectum," Archiv für Anatomie und Physiologie, 1878, p. 171.

[2] Petersen, "Ueber Sectio Alta," Archiv für klinische Chirurgie, 1880, T. XXV, p. 751.

[3] Pirogoff, "Anatome topographica Sectionibus per Corpus humanum Congelatum triplici Directione Ductis Illustrata," Petropoli, 1852–59.

[4] Braune (Wilhelm), "Topographisch-Anatomischer Atlas, nach Durchschnittem an Gefrorenen Cadavern," Leipzig, 1867–72.

[5] Rüdinger, "Supplement zur Topographisch-Chirurgischen Anatomie des Menschen," 1879.

[6] Berry Hart, "The Effect of Distention of the Rectum on the other Pelvic Viscera," British Medical Journal, 1882, Vol. II, p. 577.

[7] Symington, "On the Position of the Empty and Distended Bladder in the Male Child," Edinburgh Medical Journal, April, 1885, p. 908.

[8] Fehleisen, "Ueber die Verschiebung der Harnblase bei der Tamponnade des Rectum," Archiv für klinische Chirurgie, 1885, T. XXXII, p. 563.

[9] Strong, "Frozen Sections of Male Pelvis showing the Relations of the Peritoneum to the Abdominal Wall, Bladder, and Rectum, with Special Reference to Suprapubic Cystotomy," ANNALS OF SURGERY, 1888, Vol. VII, p. 22.

[10] Paul Delbet, Anatomie chirurgicale de la Vessie, Paris, 1895.

[11] Trendelenburg.

[12] Bristow, "The Use of Air to Dilate the Bladder in Suprapubic Cystotomy," ANNALS OF SURGERY, June, 1893.

To Garson and Petersen is unquestionably due full credit for re-establishing this valuable operation upon sound surgical principles, just as to Lister is mainly due the world's commendation and gratitude for the aseptic methods of surgery prevailing to-day, although he initiated them, not so directly, but by the correlated branch of antiseptics. So we may maïntain that the effective but cumbersome and not wholly safe method of Petersen, which has served its purpose and served it well, should be retired in favor of simple air,—a substitute systematically proposed by Bristow in June, 1893, and apparently first put in practice by Keen[1] a month later, July 8, 1893. Although Keen[2] has the credit of priority in suggesting the pumping of air into the bladder for a different purpose, he accords, in describing his suprapubic operation, full recognition of Dr. Bristow's paper, as follows:

> "I adopted the suggestion of Dr. A. T. Bristow and injected nine ounces of air into the bladder. This distended the bladder satisfactorily, forming a distinct elastic tumor, etc. An incision in the middle line discovered the bladder very well. The peritoneum was not seen. . . . My experience in this single case is such that it would certainly lead me to adopt Dr. Bristow's suggestion in the future unless further experience discloses some unsuspected disadvantage. I did not use the Petersen bag in the rectum for lifting up the bladder, and I found that the bladder was better lifted up by the air alone than by the usual method with water in the bladder and the bag in the rectum," etc.

In the ANNALS OF SURGERY for June, 1893, appears Dr. Algernon T. Bristow's paper, entitled "The Use of Air to Dilate the Bladder in Suprapubic Cystotomy." Since all that is therein contained is pertinent to the subject, I reluctantly break the continuity of his paper by the following disjointed quotations:

> "The most important point to be borne in mind in considering the relative merits of air and water as distending agents is the liability

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[1] College and Clinical Record, Philadelphia, December, 1893.

[2] "A New Method of Ascertaining whether the Bladder is or is not Ruptured," ANNALS OF SURGERY, July, 1890, Vol. XII, p. 35.

of the diseased bladder to rupture under any distention whatever. Now water is almost absolutely incompressible. Air, however, is an extremely elastic and compressible gas.

" In the case of a non-distensible bladder it is quite evident that as far as the liability to produce rupture is concerned air is very much safer than water.

" Its efficiency is next to be considered. If a bladder is capable of dilatation at all, I believe this can be accomplished by the use of air.

" I have never met a case in the cadaver in which air did not promptly lift the bladder out of the pelvis. There is a great difference in this respect between air and water. Water first fills up the lowermost parts of the bladder and does not lift it out of the pelvis at all. In fact, the weight of the water has a tendency to keep the bladder low down, and it is only as it is distended with fluid that the anterior wall rises above the symphysis. I noted the rectal bag must be used before the bladder can be brought well within reach. The first effect of the water is to distend the most dependent part of the bladder, which is the very part which does not concern us with reference to the incision. Air, on the contrary, at once lifts not only the anterior wall and fundus up against the abdominal wall, but the whole viscus as well."

" In opening the bladder afterwards air has another advantage over water, which is that it gives a dry wound instead of one filled with blood-stained fluid escaping from the opening in the incised bladder wall."

" It may be urged against inflation that because of the compressibility of air the amount of distention cannot well be estimated nor the quantity of air measured."

If one inflates the bladder before making an incision he can as easily judge of the amount of distention by the evidence of percussion and palpation, but if an incision reaching to the fascia transversalis is first made, the appropriate amount of inflation can be determined by the eye. (F. T. B.)

" The question of hypertrophy does not concern the agent used to distend the bladder so much as the degree of force which may be safely used in the distention, and in such a case air appears, for the reasons given, to be safer than fluid.

> "If an hypertrophied and thickened bladder can be lifted in the pelvis *at all* by its distention the fundus can be carried above the symphysis, and the anterior wall thus rendered available for the extraperitoneal incision, air adding as it does no weight to hold the viscus anchored in the pelvis, will, by virtue of its elasticity, prove not only more efficient, but far safer than water."

If intraperitoneal rupture of the bladder should occur under filtered aerial distention the amount of momentary soiling of this membrane would naturally be less extensive than if the same accident occurred with water holding in suspension much deleterious matter. (F. T. B.)

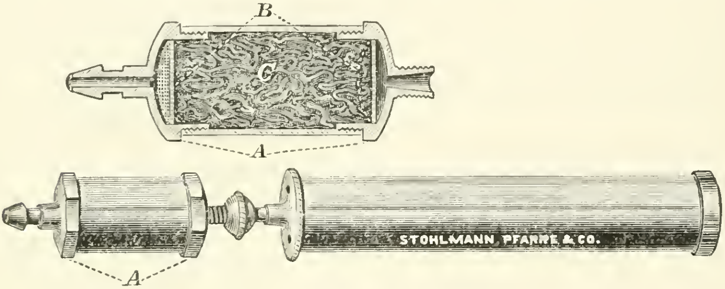
In a recent paper, entitled "Two Cases of Intraperitoneal Suprapubic Cystotomy for Stone," Dr. M. H. Richardson, of Boston, after speaking of the changes undergone by bladders for a long time the habitat of large stones, and the resulting disadvantageous contractions which render the extraperitoneal operation impossible, says,—

> "The prevesical space in the healthy bladder can be made to reach high enough above the pubes to permit the removal of the largest stone or the most extensive tumor without opening the peritoneal cavity. By distending the bladder with air, even without distending the rectum, the line of peritoneal reflection can be seen to rise fully a hand's breadth above the pubes; . . . but if this space is so broad in the healthy individual it may be so limited by disease that the peritoneal reflection," etc.

Despite such occasional authoritative statements regarding air-distention of the bladder, it seems to me to be receiving very tardy recognition, and it is to be noted that the contributors of the articles on genito-urinary subjects in the recent surgeries and hand-books of reference, detail Petersen's method and barely allude to air, its simpler, safer, and more effective substitute. It may be that the want of some ready and reliable contrivance for throwing air into the bladder has been the main cause of its tardy acceptance. In attempting to throw air into the bladder with a Davidson's syringe, others may have had the same experience as my own,—namely, that the valve of a syringe which worked perfectly with water would, at frequent intervals in attempting to pump air, fail to respond to the pressure of this lighter medium unless the valves were held in a way to be aided by gravity at the same time.

I believe the small, double acting bicycle-pump will prove to be the most convenient thing for bladder inflation. I have had made a small, cylindrical, metal air-filter to take the place of that part of the pump-handle ordinarily screwed to the end of the piston-rod. This detachable cylinder has, within the screw-cap at each end, a disk of very fine wire mesh, which retains the intervening cotton-filter in place. (See figure.)

The entire apparatus can be treated by dry sterilization before the operation. New sterilized cotton being used each time in the filter. Then when attached to the catheter by which the bladder has been already cleansed the pump will be in place and ready for action at any moment.



Author's aseptic air-filter. *A*, screw ends attaching to the cylinder. *B*, movable wire screens of fine mesh to retain cotton filter in place. *C*, cotton chamber.

As this appliance is well suited for making the air-test for ruptured bladder, already alluded to as Dr. Keen's[1] suggestion, it will not be out of place here to detail his proposition.

(1) "Introduce the catheter and empty the bladder of any urine that may be present.

(2) "Connect the catheter with an ordinary Davidson's syringe (disinfected), over the distal end of the syringe a moderately copious mass of absorbent cotton is tied, the cotton acts as

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[1] "Two Suggestions in Surgical Technique," ANNALS OF SURGERY, July, 1890, and Proceedings of the Philadelphia County Medical Society, 1890.

an atmospheric filter. Air is then pumped into the bladder; should no rupture have occurred, the rounded, elastic, tympanitic bladder will appear in the hypogastrium; should there be a rupture, the air will escape through the rent into the general peritoneal cavity and distend the entire belly."

The author adds that although ordinary air is probably safe in either case because, if no rupture exists, the mucus surface of the bladder will not suffer, and if a rupture does exist an immediate laparotomy would be done. "Still," he says, "I should decidedly prefer to filter the air and so exclude any possibility of infection."

In regard to the detail of epicystotomy under consideration, my method since 1894 has been to pass a soft rubber catheter to the bladder, there retaining it by a narrow bandage tied lightly about the penis. Cleansing the bladder, according to the particular requirements with normal salt solution, Thiersch's solution, or mercuric bichloride solution, not stronger than 1 : 15,000. Unless the patient has a pendulous belly or it is seen that light can reach the bladder best by elevation of the hips or Trendelenburg's posture, I do not use it. In other words, if the bladder is distended with air, both the Petersen rectal bag and the Trendelenburg posture can be dispensed with when elevation of the prevesical peritoneal fold above the symphysis pubis is the only desideratum.

To the catheter already in place the sterilized air-filtering-pump is attached and left lying on a towel stretched across the thighs.

A suitable length median incision is begun a trifle below the upper margin of the symphysis and deepened to expose the fascia transversalis; the pump is then used to bring the bladder closely in apposition with the undivided fascia; to do this may require four or five pistonings of the pump or it may take ten or twelve. I am only concerned to elevate the bladder enough to detect it close under and extending above the wound. Now if the peritoneum is not abnormal at this region I know that its subpubic fold is more or less above the symphysis. An artery clamp then closes the lumen of the catheter, or this is effected by my four-way stop-cock, which generally unites the pump and catheter.

The fascia is incised close to the symphysis and enlarged upward upon the underlying finger; in this opening the peritoneum may or may not be seen at some point between the symphysis and the upper angle of the wound. If met, it is tucked under the upper angle and there retained by a blunt retractor. The loose prevesical adipose tissue is cut in the median line. When the bladder wall is exposed, it may be deemed advisable to incise it at a higher or lower level than that opposite to the wound; if so, the zone of the inflated viscus is readily changed by permitting the escape of a little air or altered in the opposite direction by an additional action or two of the pump.

With curved Hagedorn needles silk retractors are passed through the walls of the viscus half an inch apart. The incision is made below rather than above the middle point between these retractors so that they may act as a fender for the peritoneum when this membrane tends to come down as the opened bladder collapses.

Each in and out piston-action of this particular air-pump is about equivalent to moving one ounce of water, as is shown by an inverted flask filled by fifteen ounces of water, and which requires between fifteen and sixteen pistonings to force it by the superimposed air from the flask into an artificial rubber bladder supported in a bony pelvis. Such a manikin shows also that when the bladder contains fifteen ounces of water, the white silk peritoneal fold is scarcely lifted clear of the symphysis. Whereas, if one empty the bladder of fluid and distend it with but ten pistonings of air from the pump, the peritoneum rolls up out of sight beyond the upper angle of the suprapubic incision, which at this point is three inches above the symphysis.

ACTINOMYCOSIS.[1]

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ACTINOMYCOSIS is a specific infectious disease of cattle, which occasionally occurs in man. It is characterized by its long duration, by the formation of extensive granulation tumors, giving the appearance of abscesses, but having a peculiar and characteristic hardness. These apparent abscesses when incised do not present large cavities, but a mass of granulation tissue traversed by sinuses. These are filled with a pus-like detritus, in which are found small yellow bodies or granules, which consist of colonies of the fungus or cladothrix which is the cause of the disease.

History.—To Bollinger,[2] a veterinary of Munich, is conceded the credit of having first (1877) discovered and described the "ray-fungus" as constantly present in and as the cause of the disease called "lumpy jaw," etc., in cattle, although Hahn, and two Italians, Perroncito[3] and Rivolta,[4] of Pisa, claim to have discovered the fungus some years previously (1868).

Bollinger referred the specimens to the mycologist Harz,[5] of Munich, who suggested the name actinomyces for the fungus, from the Greek *aktis*, a ray, and *mykes*, a fungus.

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[1] Read before the New York Surgical Society, April 24, 1895.

[2] Bollinger, Correspondenzblatt niederrheinischen. Vereins für offentliche Gesundheit, 1879; Aerztlich. Internation. Blatt, München, 1878; Ueber eine neue Wild und Rinderseuche welche im Sommer 1878 in der Umgebung von München beobachtet wurde.

[3] Perroncito, Deutsche Zeitschrift für Thiermedicin, 1879, Vol. XXXIII–XL; Enciclopedia agraria Italiana, etc., 1875, 569; Annali della Reale academ. d'agric., Turin, 1878.

[4] Rivolta, Il, Med. Veterin., Turin, 1868; Giornale de'Anat., Pisa, 1875, 198; La Clinica Veterin, Milan, 1878; Sopra un nuovo microminte del Cavallo, 1879, 145.

[5] Harz, Jahresbericht der Münchener Schule, 1877–78.

James Israel[1] was the first to describe the disease in man as being caused by a fungus, but he did not discover the identity between this and the disease in cattle. He sent the foul smelling pus to Ferdinand Cohn, who accurately described the fungus.

Ponfick,[2] in 1879, from the study of a case of human actinomycosis of the pleura and lung, comparing the findings with those sent him from Bollinger's cases, claimed the identity of the disease in man and animals.

Johne[3] was the first to demonstrate by inoculations that the fungus was the cause of the disease in animals.

Etiology.—The essential specific cause of actinomycosis is the ray-fungus. It enters the body with the food, as is shown by the fact that the disease is usually situated in the mouth or intestinal tract. It has been asserted that a solution of continuity is necessary for infection to take place; and usually this is found to be the case, for the disease most commonly starts by lodgement of the fungus in a carious tooth, or a wound in the soft part of the mouth.

The argument for this assertion is that the actinomyces is too large to enter the tissue as true bacteria may, and that it must find a lesion in which to lodge and start the disease. The disease being established at one point may become widely disseminated through the body by metastasis. But Bollinger[4] reported a case of primary actinomycosis of the brain, situated in the third ventricle. This was the only site of the disease to be found, and it would be begging the question to claim that this was a metastasis from some primary disease, say in the mouth, which had healed. It is more probable to assume that the disease may occur by entrance of the spores of the cladothrix, which are small, and may enter through an unabraded surface, and thus start the disease wherever they happen to find a lodgement.

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[1] James Israel, Virchow Archiv, 1878, No. 74, 15.

[2] Ponfick, Berliner klinische Wochenschrift, 1879, 345; Breslauer Aerztliche Zeitschrift, 1879, I, 116.

[3] Johne, Deutsche Zeitschrift für Thiermedicin, 1881, VII, 141.

[4] Bollinger, Münchener medicinische Wochenschrift, 1887, XLI, 789.

In animals it has been found to have originated in the mouth by the penetration into the soft parts of a sharp piece of grain.

In Soltmann's[1] case it was started by a bit of rye being embedded in a boy's pharynx. And in James Israel's[2] case an actinomycotic carious tooth became broken, and a piece was inhaled into the lung where it started the disease.

It has been found that grain that has lain on damp ground, or that has grown on land reclaimed from the sea, as in the Netherlands, is frequently the seat of the actinomyces.

Of course, it may be conveyed to the food by the hands, etc., if one is in contact with diseased animals or people. One case is reported where a man, who did not work in the dairy, probably acquired the disease by drinking milk, some of the cows having the "mouth-disease."

As to sex the disease is about equally distributed. It is rare in childhood, probably on account of the fact that it usually enters through carious teeth, and they are more common in adults than in children.

Partsch[3] reports a case where it originated in the site of a new cicatrix. This was a case in which a breast had been removed for an ulcerating carcinoma. Skin-grafting was done. Two months after healing had taken place the scar ulcerated and abscess opened spontaneously, the pus containing actinomycetes. The disease could not be traced to any source.

Further and more general knowledge of this disease may prove it to be far more common than it is at present supposed. Mr. Archibald Park,[4] in speaking of the human and cattle diseases in Australia, called attention to the mistake frequently made in confounding actinomycosis in rabbits and cattle with tuberculosis. He states that in Australia actinomycosis is, next to pleuropneumonia, the most common of the chronic diseases in animals. From my own experience it is fair to suppose that the disease is more often overlooked than recognized, and probably a great majority of cases are mistaken for some of the various diseases which so closely resemble it,—namely, tuberculosis, sarcoma, syphilis, pyæmia, etc. The disease is certainly a rare one, and many physicians of large experience have never encountered it. It has been my good fortune to have seen three cases, two in the jaw from carious teeth and one in the abdomen.

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[1] Soltmann, Breslauer Aerztliche Zeitschrift, 1885, XXXII.

[2] James Israel, Klinische Beiträge zur Kenntniss der Actinomycosis, etc., Berlin, 1885.

[3] Partsch, Deutsche Zeitschrift für Chirurgie, 1885–86, XXIII, 497.

[4] Park, British Medical Journal, 1891, I, 145.

Biology and Morphology.—On this subject I shall have but little to say, for it belongs so essentially to the laboratory specialist. Actinomyces is usually classed among the mould fungi, or the lowest form of plants. It was so classified by its first discoverers and investigators,—namely, Harz,[1] Johne,[2] Ponfick,[3] etc., while others and perhaps later observers claim that it does not belong to this class, but to the highest order of bacteria,—namely, the cladothrix. (Affanassiew[4] and Schultz,[5] Bostroem, Israel.[6]) In its most characteristic form, it consists of threads radiating from a common centre, terminating in blunt ends or clubs, giving the sun-burst or rosette appearance from which it derives its various names (actinomyces, strahlenpilts, ray-fungus, champignon actinomycetique). While this rosette represents the characteristic appearance, the microbe is found in various stages of development, and, consequently, in a variety of shapes. We may in a specimen find merely the long threads interlacing or separated, or we may find the short clubs; these again may be single pear-shaped cells, or, where division is taking place, they may have the appearance of an open hand with the fingers apart.

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[1] Harz, Jahresbericht der Münchener Schule, 1877–1878.

[2] Johne, Deutsche Zeitschrift für Thiermedicin, 1881, VII, 141.

[3] Ponfick, Berliner klinische Wochenschrift, 1879, 345; Breslauer Aerztliche Zeitschrift, 1879, I, 116.

[4] Affanassiew und Schultz, Centralblatt für Bakteriology, V, 683; Münchener medicinische Wochenschrift, 1889, 418.

[5] Bostroem, Berliner klinische Wochenschrift, 1885, I, 14; Verhandlung des Congresses für inneren Medicin, 1885, 94.

[6] James Israel, Klinische Beiträge zur Kenntniss der Actinomycosis, etc., Berlin, 1885.

Besides these threads and clubs, cocci are found which are capable of development into a complete colony. Mr. McFadyean[1] describes the history of an actinomycotic colony thus:

(1) It has a starting point in one or more cocci.

(2) The cocci multiply by elongation and subsequent fission.

(3) The elongation of the cocci gives rise to bacillary forms, and through these to long filaments.

(4) Further extension is effected by continuation of this process.

(5) The formation of the club-shaped termini is evidence of the diminishing vegetative power of the filaments, and possibly of the cocci.

Others take a different view of the microbe, and claim it properly belongs to the still higher order,—namely, the basidiomycetes. If this be so the clubs would not represent a stage of decline or degeneration, but rather the organs of fructification of the fungus. This is rather borne out by the fact that daughter clubs are seen growing from the mature ones.

Inoculation.—Johne[2] (1881) was the first to demonstrate the fact that the disease could be conveyed from animal to animal by inoculation of cattle. James Israel[3] produced it in rabbits.

Max Wolff and James Israel[4] made the first successful inoculations (in rabbits) from pure cultures grown on glycerin agar-agar, and upon coagulated egg albumen. In the peritoneum were found encapsulated masses, consisting of round cells and the colonies.

Cultivation.—In 1885, Bostroem[5] made successful cultivations on coagulated blood-serum and agar-agar. In 1890, Wolff and J. Israel[6] published the result of extended cultivation experiments. The ray-fungus will grow in both streak and stab inoculations. It can be grown in blood-serum, egg albumen, glycerin agar, etc. The colonies are matured in about six days, in the surface cultivation.

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[1] British Medical Journal, 1885, June 15.

[2] Johne, Deutsche Zeitschrift für Thiermedicin, 1881, VII, 141.

[3] J. Israel, Centralblatt für die medicinischen Wissenschaften, 1883, 23, 481.

[4] M. Wolff und J. Israel, Verhandlung der deutschen Gesellschaft für Chirurgie, 1890, I, 80.

[5] Bostroem, Berliner klinische Wochenschrift, 1885, I, 14; Verhandlung des Congresses für inneren Medicin, 1885, 94.

[6] M. Wolff und J. Israel, Verhandlungen der deutschen Gesellschaft für Chirurgie, 1890, I, 80.

Examination.—Macroscopic appearance: When seen in the tissues or in the discharges, the fungus colonies give the appearance of small yellow granules about the size of a pin-head. These granules have been compared to small masses of sulphur or iodoform. They are a pale yellow in a reflected light, and a brown-yellow in a transmitted light. Those taken from animals give a gritty sensation. Those taken from human cases feel more like fat.

Microscopic,—The fungus may be examined by making sections of granulations, or by crushing this soft tissue between cover-glasses. Or we may make cover-glass smears of the discharge. These should be dried by exposure to the air, and should not be passed through a flame, for the heat will destroy the characteristic appearance. Fresh smears may be examined wet. The fungus can be seen very readily without staining. Of course, proper staining will greatly aid one in making the investigation. I am indebted to my friend Dr. John S. Billings for the following directions for staining specimens of this fungus:

" The best hardening agent for specimens of actinomycotic tissue is absolute alcohol; this should be changed several times. Embed the specimens in collodion and cut sections in the ordinary way. If paraffin be used, the masses of granules break down and escape. Should any calcareous matter be present the specimen should be put through a dilute solution of hydrochloric acid.

" *Staining Methods.*—Gram's method followed by eosin as a contrast stain is probably the best for general use. Make a saturated aqueous solution of aniline oil by shaking together fifteen to twenty drops of aniline oil and eight to ten cubic centimetres of water; pass this through a moist filter. Add to this a few drops of a saturated alcoholic solution of gentian violet until a slight turbidity appears. Let the section remain in this mixture for four or five minutes, and then remove to a solution of iodine and potassium iodide (iodide, 1; potassium iodide, 2; water, 300). It is to be left in this solution until the violet color entirely disappears; this can be tested by bleaching in absolute alcohol from time to time. The section is then placed in a 0.5 per cent. solution of eosin in 70 per cent. alcohol for about a minute, washed in water, and then passed successively through 70 per cent. alcohol, absolute alcohol, and oil of cloves, after which it is mounted in Canada balsam. The actinomycotic filaments are stained violet and the tissue elements red.

"Weigert's process may also be used. The sections are first stained for about an hour in the following solution (Wedl's litmus solution): To fifty cubic centimetres of 50 per cent. alcohol add four cubic centimetres concentrated acetic acid, and as much French extract of litmus as will make the fluid of a dark-red color; filter several times. The section of tissue, or cover-glass, is next passed through 95 per cent. alcohol, and is then stained for a minute or so in a 2 per cent. aqueous solution of gentian violet. The fungus threads are stained red and the surrounding tissue violet. A good stain to show the finer structure of the clubs is the Ehrlich-biondi triple stain. This is a mixture of methyl-green, orange, and acid fuchsin. The preparation of a satisfactory solution is so difficult that it is advisable to procure the stain in powder-form already mixed. It is sold under the name given above. A saturated solution of the powder in 20 per cent. alcohol is made, to which a few drops of glycerin are added. Sections remain in the stain for some hours, cover glasses only a few minutes. They are then washed in dilute alcohol and cleared and dehydrated as in Gram's method. Many other procedures have been recommended, most of them being based upon the use of ether and alkaline solutions to dissolve away the fatty and other detritus which surround the masses of granules. The specimens are then stained with some single stain such as eosin or fuchsin." While mycetoma or Maduro foot was originally described as a distinct disease, and is still so considered by many able observers, there is but little doubt that it is a form of actinomycosis.

Pathology.—Though actinomycosis is usually attended by the formation of pus, it is claimed by many and correctly that the ray-fungus is not a pyogenic microbe, but that the suppuration is caused by coexistence of the ordinary pyogenic bacteria.

How the microbe exerts its influence is of course unknown, but when it has once entered the body and found lodgement for development it at once starts a characteristic form of inflammation of a low grade, resulting in a remarkable production of granulation tissue, which is traversed by sinuses about a quarter of an inch in diameter, and honey-combed by small cavities. Embedded in the tissue and mixed with a detritus or pus are to be found the sulphur-yellow masses described above, consisting of the colonies of actinomycetes.

According to Firket,[1] coagulation necrosis does not occur, but the first process is the establishment of a cellular hyperplasia. At first there are round cells. As the process of inflammation advances epithelioid and giant cells are plentifully found surrounding the colony. This production of granulation tissue results in the formation of extensive tumors, and if pyogenic infection is not added the disease will take on a more chronic form and be of the nature of a neoplasm rather than an inflammation. If pyogenic infection take place the disease will become more active, advancing rapidly, and breaking down through the formation of abscesses. Diffuse phlegmon may occur, but, as a rule, even when suppuration takes place, the abscesses do not form large cavities, but rather sinuous tracts, *and the disease should be suspected on account of the hard tumor-like feel to the touch, which is unlike the boggy sensation of an ordinary inflammatory swelling, also on account of scanty contents of the cavities. In fact, it always suggests a true neoplasm.*

As the transformation into granulation tissue occurs in the connective tissue, the disease will follow the intermuscular planes, and will often separate and expose nerves and large vessels, rendering profuse hæmorrhage liable. In pure actinomycotic infection, the lymphatics are not invaded, and this is not apt to occur even in pyogenic cases.

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[1] Firket, Revue de Médecine, 1884, IV, 273.

Metastasis is common. It occurs through the blood-vessels by the transmission and deposit of emboli.

Of course, the anatomical character will be modified according to the organs and tissues invaded.

Bone.—Its most common site is in the jaw (usually the inferior maxillary). Here it forms large tumors in the bone itself, extending to the periosteum, and it is often mistaken for osteosarcoma. There is frequently a sinus leading to the face or neck. This was the case in the two instances I have observed. The peculiar hardness of the tissues around the sinus and the presence of the sulphur bodies in the discharge furnished the points for clinical diagnosis.

If the disease extends from the jaw through the deeper planes to the neck, it may clearly resemble angina Ludovici.

Lung.—In the lungs the disease is prone to suppurate and break down, forming sinuses into the bronchi and causing a fetid expectoration. It frequently extends to the pleura and produces an actinomycotic empyema.

Vertebral and prevertebral actinomycosis are comparatively common. Here the disease is very wide-spread, and cannot be distinguished from tuberculosis of the vertebræ, except by examination of the discharge.

Brain.—The brain becomes the seat of disease either by extension from the superior maxilla or by metastasis. In one case cited above it was primary. It usually presents the character of a granulation tumor and of a brain abscess.

Abdomen.—Intestines: Here two varieties are recognized, (*a*) catarrhal, where it occurs in the mucous and submucous layers in isolated patches, each presenting the characteristics of the disease; and (*b*) the parenchymatous form where it has extended to the deeper coats of the intestines, massing their coils together by invading the peritoneal surfaces. This is wide-spread, and usually extends to the abdominal wall, which is finally perforated with multiple sinuses. From the intestine, any one of the abdominal organs may be invaded in like manner.

Zemann[1] reported a case in which the right Fallopian tube composed a large abscess with no exit, the walls being lined with actinomycotic granulations. He also records cases where autopsy showed the disease as para- and perimetritic.

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[1] Zemann, Wiener medicinische Jahrbücher, 1883, 477.

Langhans[1] reports a case where the disease started in the appendix vermiformis. The principal disease was in the liver. The appendix was found in an abscess to the right of the bladder. The interior of the appendix showed old cicatrices of apparently healed "catarrhal" actinomycosis.

Skin.—Primary actinomycosis of the skin has been described by Hochenegg,[2] Kaposi, Leser,[3] Tommassli, and others. Here it very closely resembles tuberculosis, both clinically and histologically. It consists of a reddened, elevated spot which slowly breaks down into an ulcerating granuloma. It extends by formation of new nodules at the periphery of the primary lesion. The disease invades principally the corium; the lymphatics are not invaded. It advances to the deeper parts by the formation of the characteristic sinuses.

Symptoms.—In an uncomplicated actinomycosis, that is to say, one in which a pyogenic infection is not added, the symptoms are really those of a neoplasm, and it very closely resembles the clinical picture of a case of sarcoma wherever situated. The disease is very slow in its development, sometimes extending over a period of several years. (In Kaposi's case, it lasted more than twelve years.) It is painless, except from the effects of nerve pressure and stretching. It is afebrile. Perhaps its only evidence will be the existence of the granulation tumor.

However, the disease is nearly always complicated by pyogenic infection after it has existed some time. Whenever this occurs the course will be more acute, the extension more rapid, metastasis more common, and the symptoms will be those of both a neoplasm and of a chronic septic infection. Of course, the symptoms will correspond to the regions and organs affected, and it would take too much space for me to go fully into its clinical description in a paper of this sort, so I shall give a brief summary.

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[1] Langhans, Correspondenzblatt für schweitzer Aerzte, 1888, 329.

[2] Hochenegg, Wiener medicinische Presse, 1887, 537, 613.

[3] Leser, Wiener medicinische Blätter, 1888, XII, 303.

Alimentary Tract.—Mouth: This is the most usual seat of the disease, and it is commonly found in the lower jaw. Here it is found to have started in a carious tooth, extending to the jaw-bone and thence to the periosteum, and then to the soft parts. There is a swelling which may be mistaken for a slowly-developed abscess about the tooth-socket, or it may be mistaken for a rapidly-growing sarcoma. Sooner or later a sinus will form, and the softened mass will discharge its characteristic detritus either through the skin of the face or neck, or into the mouth cavity. The following is a typical case of this sort:

Senn.[1] German, aged thirty years, general history and past history negative. No knowledge of having had any contact with diseased animals. He was a soda-water manufacturer by occupation. During the winter of 1886, he suffered from what he supposed to be an ordinary cold; the right side of lower jaw was swollen and painful. One of the molar teeth being diseased was removed; this did not relieve the pain and swelling, and all of the lower molars on that side were removed. Patient was admitted to the Milwaukee Hospital six months after the first symptoms appeared. At this time the lower jaw presented a fungus mass, extending from the angle to the first bicuspid tooth. The growth spread as far as the tonsil. The cheek was enormously swollen from the angle of jaw to the lower margin of the parotid gland. Skin over the swelling was pale and glossy. The superficial veins were considerably dilated. There was no distinct border line, the infiltrated parts fading gradually into the healthy margin. There was an abundant discharge from the granulation surface and from many open sinuses. Senn suspected the disease, and on examination found the actinomyces, clearing up the diagnosis. Excision of the mass was attempted, but was not successful, and patient died from the continuation of the disease, four months after the first operation.

Intestine.—Here the symptoms may be very vague and indefinite till the disease has advanced considerably.

Pain seems to be an early symptom of the intestinal actinomycosis. The patient refers to the fact that he first suffered from severe lancinating pains or cramps in his abdomen.

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[1] Senn, Principles of Surgery, 1895, 600.

Constipation and irregularity of defecation are the rule. If the fæces are carefully watched, the ray-fungus may be detected. After a time, as the disease advances, a tumor will be found either in the abdominal cavity or in the abdominal wall. If this be opened spontaneously or surgically, the characteristics are found. When the disease involves the abdominal wall, it usually forms a number of fistulæ from the softening and breaking down of the multiple nodules which it produces.

These patients usually show a peculiar pallor and marked marasmus.

It is remarkable to note the fact that most of the cases of abdominal actinomycosis present sinuses below the level of the umbilicus only.

Typical Case.—S. Laache.[1] Coachman, aged thirty-eight years; always well till two years before he was seen by Dr. Laache. Then he had at first digestive disturbance, which was temporarily relieved; also had persistent anæmia. Admitted to the hospital in November, 1888.

Increasing digestive disturbance causing abdominal pain; vomiting; later, slight nocturnal chills; increasing emaciation and pallor; constipation. Tumor appeared to left of umbilicus. Skin over tumor was at first normal and movable. Tumor was immovable and hard, evenly so, except at a point over the centre which was fluctuating. Other tumors appeared. They progressed in the usual way, till finally the superficial fascia was involved, and then the skin. Principal tumor was incised and characteristic contents found. Patient died on February 23, 1889. Autopsy showed very general actinomycosis of the abdominal viscera. Disease was thought to have started in the appendix vermiformis.

Thorax.—Lung and pleura: Primary actinomycosis of the lungs may occur by the lodgement of the microbe in the bronchi.

Here the disease will present the clinical features of tuberculosis. Pyogenic infection is always added, and consequently the progress of the disease is rather rapid, and from the same we have the addition of septic symptoms,—namely, elevated temperature and accelerated pulse-rate. Breaking down takes place, and the actinomycotic detritus, mixed with mucus and pus, produces a profuse fetid expectoration. Proper examination of the sputum can alone establish the diagnosis.

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[1] Laache, Norsk Magazin for Largeviduskaben, 1892, 12.

Fistulous openings are always liable to occur. The disease is usually situated in the posterior and lower portions of the lungs, rarely in the apex.

From the lungs the disease spreads to the pleural cavity, and we then have an actinomycotic empyema.

From the thorax the disease is very prone to extend to the vertebræ and to the prevertebral region.

Brain.—Here the symptoms will depend on the situation of the disease rather than upon its nature. The symptoms will be those of brain tumor and of brain abscesses.

In Bollinger's[1] case there were headache, optic symptoms, and attacks of lost consciousness.

In Keller's[2] case the diagnosis was made during life. In the second year of an actinomycosis of the pleura, etc., the patient developed a left side, slowly-advancing hemiplegia. This was finally followed by convulsions and by coma. Burger operated, opening an actinomycotic abscess in the right ascending parietal convolution. The operation gave almost complete relief temporarily, but the disease was not eradicated and the patient died within a year.

Skin.—Here the disease appears as an elevated nodule, red and hard. After a time this softens and breaks down by ulcerating in the centre. This destruction extends to the periphery and leaves a granulation patch, the exudate from which contains the actinomycetes. At the periphery will be found small nodules which consist of colonies of the microbe surrounded by the cellular hyperplasia described in the paragraph on pathology.

Cicatrization may occur, but after a time the disease will break out again in the same site, unless the whole area has been removed or destroyed.

Diagnosis.—The only method of arriving at a positive conclusion is to find the characteristic ray-fungus in the tissues or in the detritus. *The presence of swellings which have the appearance of abscesses and yet have the characteristic hardness which, when opened, show very scanty contents as compared with the amount of diseased tissue, should make one suspect the disease. Added to this, the discovery in the discharge of the sulphur-yellow bodies should make one comparatively sure that it is actinomycosis. The demonstration of the ray-fungus by the microscope makes the diagnosis certain.*

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[1] Bollinger, Münchener medicinische Wochenschrift, 1887, 41, 789.

[2] British Medical Journal, 1890, 709.

Clinically and histologically it may very closely resemble both tuberculosis and sarcoma, and there is no doubt that many mistakes are made on this account. An examination of the tissue alone is not sufficient, for this granulation tissue may be diagnosticated as sarcoma. My own experience has taught me that diagnosis of sarcoma, even by the best microscopists, is not to be relied upon.

As I said before, the diagnosis of actinomycosis can only be made when the actinomycetes are found. In cases where the tissue or detritus is available, the diagnosis is easily made, for the colonies are always abundant, and it is only necessary to make the proper investigation as detailed above; but the disease is so little known to the general practitioner that a thorough examination is seldom made, and consequently the majority of cases must pass unrecognized. Since the discovery of the true nature of the disease, over four hundred cases have been recorded, and I am sure that these represent but a small portion of the cases that have occurred during that time.

Prognosis.—It is almost universally conceded that when the disease cannot be entirely eradicated by surgical means it is sure to end fatally. Some have claimed that the disease is curable by other means. Of this I shall speak under the head of treatment.

The disease has a slow course and may extend over a number of years. Its duration is very much modified by its situation and by the addition of pyogenic infection. In the abdomen and brain it usually proceeds more rapidly than elsewhere. When the disease is complicated by the pus-producing bacteria, it assumes a more malignant type and advances more rapidly than before, both by extension and by metastasis.

Unless some special cause of death arise owing to the organs involved, exhaustion and marasmus terminate the case. In chronic purulent cases, amyloid degeneration of the liver and kidneys is established and aids in bringing about the fatal result.

Treatment.—Nearly ten years ago, O'Neil[1] stated that he believed that iodine, arsenic, and mercury exerted a curative effect in the early stages of the disease ; but he advised surgical ablation as the only treatment to be relied upon.

Thomassen, of Utrecht, was one of the first to strongly advocate the use of potassium iodide in actinomycosis. We have also the same testimony from a number of other observers. Lately from Italy[2] and from France[3] we have very enthusiastic accounts of the curative effect of this drug. Certainly, it should be thoroughly administered in all inoperable cases.

On the other hand, we have an immense array of testimony to the effect that surgery alone can produce a cure.

The disease is usually clearly limited by a distinct line of demarcation, and if one is ablating a diseased area it is only necessary to cut about half an inch beyond the apparent involvement. Infection of the operation field must be prevented by thorough cleansing and by the use of disinfectants.

Opening and draining an actinomycotic abscess are always attended by immediate improvement, sometimes by an apparent cure ; but the disease is never eradicated thus and will reappear later. When a cavity is to be opened, its wall should be thoroughly removed by a sharp spoon and thoroughly disinfected by a strong bichloride of mercury solution, or by actual cautery.

Granulomata may be removed from bone by scraping, but it must be very thoroughly done.

When the knife is not applicable, destruction may be accomplished by means of caustics. Nitrate of silver has a very destructive effect upon the ray-fungus. Kottnitz[1] reports the cure of four cases by freely plunging a solid stick in all directions through the granulations.

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[1] O'Neill, Lancet, 1886, II, 342.

[2] Buzzi and Galli, Valerio, British Medical Journal, August 5, 1892.

[3] Netter, La Semaine Médicale, November 10, 1893; La Bulletin Médical, 1893, 987; Mennier, La France Médical, 1893, 168; La Progrés Médical, 1893, 200,

Billroth is said to have cured a case with tuberculin.

I am anxious to try the toxin treatment as applied to sarcoma. Such experiments might aid in throwing light on both diseases.

The following case of actinomycosis has recently been under my personal observation:

Rosalie Cohn, aged sixty years; married; Hebrew; admitted to Lebanon Hospital, October 24, 1894. Heart, lungs, etc., normal; urine, specific gravity, 1010; no albumen; no casts; no sugar; temperature 99° F.; pulse 80; respiration 20. Patient is emaciated and very pale. Has the appearance of one having a malignant tumor. Illness began four years ago. Her first symptom was pain, cramps in the lower part of her abdomen. After a time she noticed swellings in her abdomen. Later these softened in a number of places and were opened. She was for some time in one of our hospitals, but finally was discharged. She states that the doctors said she had the "sugar disease" (diabetes) and could not be cured.

Examination.—There are to be seen several scars showing that healing had occurred after the openings were made. She says that these openings gave her temporary relief, but that a swelling would soon appear at another place.

There were two fistulæ discharging scanty pus and detritus. These fistulæ were surrounded by peculiarly indurated masses, and it seemed as though the abdominal wall was occupied by several tumors.

Just above the groin on the left side was a swelling still larger than the rest, the skin over it was tense and glossy red. It was very hard on the margins, but soft in the centre. It looked like an abscess about to open spontaneously. The history of the case was peculiar, and the characteristic feel of these swellings made me suspect actinomycosis, so I pressed some of the discharge from one of the open sinuses and found in it the sulphur-yellow bodies. My friend, Dr. George T. Elliot, kindly examined some specimens for me and found plentiful colonies of the ray-fungus.

This patient remained in the hospital about two months. She refused any extensive operative treatment. I opened the large swelling over the groin and scraped out the sinuses. At first this freshly-opened abscess discharged abundant yellow bodies, but after a time they became more and more scanty. I did nothing at first but open this swelling so that I could watch its progress. Though it seemed like a large abscess before it was opened, it contained very little pus and detritus. Instead of opening into a large cavity, as one would have expected, it was found to be more like a sinus with very thick walls composed of granulation tissue.

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[1] Kottnitz, Deutsche medicinische Wochenschrift, 1891, 1047.

This patient's temperature was practically normal during stay in the hospital, once or twice I dammed up the opening so as to collect some specimens; this would cause a fever of one or two degrees.

Vaginal and rectal examination showed a mass high up in the pelvis.

She left the hospital on December 14, 1894. She had no internal treatment. One or two sinuses healed while she was there, and when she left, the disease was certainly a little less active than when she came, but it was practically unchanged, though she felt better.

Since she went home, Dr. W. W. Van Arsdale, has been treating her with potassium iodide, and says that she has improved.

NOTE.—Eleven months after this report, the patient is in fair physical condition. The local process, however, has progressed and the number of fistulæ is materially increased, so this case does not show that treatment by potassium iodide has any curative effect.

TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, November 11, 1896.

The Vice-President, Andrew J. McCosh, M.D., in the Chair.

EXPLORATORY NEPHROTOMY; SUTURE AND PRIMARY UNION OF KIDNEY WOUND.

Dr. B. F. Curtis presented a girl, nineteen years of age. For years she had had attacks of headache, coming on without apparent cause, and also attacks of severe pain in the region of the right kidney. Examination of the kidney in one of the attacks showed it to be large and tender, but not apparently movable. The headaches and symptoms referable to the kidney region did not always occur at the same time. The urine revealed nothing except that it contained much uric acid, especially at the time of the attacks, and was then also somewhat diminished in quantity. The symptoms, therefore, were rather vague, and were rendered more vague by the fact that for three or four weeks after admission to the hospital they disappeared entirely under salicylates. After three or four weeks the headaches returned, the attacks of pain in the kidney became very distinct, together with enlargement and tenderness. A provisional diagnosis of renal calculus was made, and an exploratory operation was performed on September 19. The usual oblique incision was made, the kidney exposed, and an incision made along its convex border large enough to admit the finger to the pelvis of the organ. Thorough search failed to reveal stone, and the kidney seemed perfectly normal. The wound in the kidney was closed by three deep catgut sutures, and the external wound was closed, except at the upper angle, by buried sutures. Unfortunately, a little infection of the external sutures took place, necessitating reopening of that wound. It was an interesting fact, however, that the kidney wound healed completely by primary union, not a drop of urine escaped into the wound, and the patient made a very good recovery. The kidney had been secured in the wound by one or two sutures as if for a nephrorrhaphy, for the reason that, as no stone was found, it was supposed that there was some slipping of the kidney and consequent obstruction of the ureter, in spite of the fact that he had been unable to recognize mobility of the kidney before operation. This supposition was rather borne out by the fact that since the operation she had had no further attacks, had been quite well, now two months.

NEPHRECTOMY FOR TUBERCULAR KIDNEY.

DR. CURTIS presented a second patient, a German woman, thirty-six years of age, whose symptoms dated back at least two years. A year ago one of his colleagues at St. Luke's Hospital performed nephrotomy and drained the kidney. There was pyonephrosis with discharge of foul pus into the bladder, giving rise to cystitis. The sinus leading to the kidney remained open, the kidney remained large, the vesical symptoms continued, the patient was losing ground so fast that removal of the kidney was considered necessary. Catheterization of the ureters was practised by Kelly's method, and near the mouth of the right ureter one or two superficial ulcers were seen, the bladder was rather anæmic, its vessels tortuous and dilated. The urine from the right ureter was diminished in quantity and contained some pus; that from the left kidney was abundant and was normal. These facts were thought to point to tuberculosis of the right kidney.

Nephrectomy was performed on September 8 through a rather long oblique incision parallel to the last rib. The kidney was found to measure six to eight inches in its diameters, and was nearly globular in shape. It was completely disorganized by suppuration and was very adherent, causing considerable difficulty in freeing it. After removal of the kidney, an inspection of the wound showed mucous membrane at one point, and on examination it was found that an opening had been made into the duodenum large enough to insert the thumb. The intestinal wall was covered externally by granulations, and the abscess had evidently been on the point of rupture into the bowel. It was closed by a double row of sutures. The external wound was packed and left open. The intestinal wound healed without discharge. It was intended to apply secondary sutures to the external wound, but it healed steadily without and was now almost completely closed. Dr. Curtis felt some fear of hernia, but thought it best not to interfere until positive symptoms should arise.

Attention was called to the advantage of making the incision as was done in this case, carrying it well forward to the rectus if necessary, stripping up the parietal peritoneum without opening it, and making the operation entirely extraperitoneal. He had often used a vertical incision near the rectus with a transverse branch outward, and yet kept the operation extraperitoneal. This gave all the advantages of a transperitoneal operation, while being free of the danger of infecting the peritoneal cavity. The greatest liability to make tears in the peritoneum existed when stripping that membrane from the anterior surface of the kidney. Such injuries could be sutured at once or guarded by sponges and closed at the end of the operation. For his own part, he preferred to close them before tying and cutting through the pedicle, as it was at this step of the operation that infection was most likely to occur.

Dr. John A. Wyeth asked Dr. Curtis how long he kept his second patient abed after the operation. Dr. Curtis replied, five or six weeks. Dr. Wyeth then said he thought it an essential point in all cases of abdominal section, but especially in transverse incisions, to keep the patient a sufficient length of time in bed. A year ago he had reported twenty-one cases, nineteen of which he had followed up from one year to five, and in only one had hernia occurred. All of them except that one patient had been kept abed, not being even allowed to sit up, for six weeks. The one patient insisted on going home at the end of three weeks ; was told that he would probably have hernia, but he assumed the responsibility, and sure enough hernia developed. Patients should be kept abed until firm union and fibrillation had taken place in the line of suture. Among the cases of laparotomy for appendicitis with abscess and where a free division of the muscles had been made and the wounds treated by packing, with no sutures, no hernia had resulted.

INOPERABLE SARCOMA CURED BY MIXED TOXINES OF ERYSIPELAS.

Dr. W. B. Coley presented for examination through the permission of Dr. M. Storrs, surgeon to the Hartford Hospital, and his associate, Dr. R. S. Griswold, by whom she had been treated personally, a woman, forty-two years old ; married. Her paternal grandmother died of cancer of the breast. She herself had always been well until the fall of 1895, when she first noticed a hard lump a little below the left clavicle. This grew rapidly in size, and early in December, 1895, she consulted Dr. Storrs, of Hartford. The tumor then had reached the size of a small orange, and extended into the axilla, and was so adherent to the vessels that after a consultation with Dr. McKnight, one of the other attending surgeons to the Hartford Hospital, it was decided to be entirely inoperable. The patient was rapidly losing flesh and strength. As the case was regarded as hopeless, it was decided to try the erysipelas toxines for a short time. A preparation of the mixed toxines of erysipelas and bacillus prodigiosus, made at the Loomis Laboratory by Mr. B. H. Buxton, was obtained, and the injections were begun December 16, 1895, as directed by Dr. Coley.

Small doses were given, and no chill was obtained until December 29. The injections were given daily or at intervals of two days up to February 8, forty-eight injections having been given with a result of fourteen distinct chills; the dose was eight minims of the mixed unfiltered toxines.

On February 9 a stronger solution from more virulent cultures was obtained, which produced severe reactions in doses of two or three minims.

The treatment was discontinued on March 17, 1896, since which time no further treatment has been given.

Soon after the treatment was begun the tumor began to shrink in size, and later to break down in places. This process became more rapid after the stronger solution was begun. By the latter part of March, 1896, the tumor had entirely disappeared, the patient had begun to gain rapidly in flesh and strength, and in a few months had entirely regained her twenty-five pounds of lost weight. She is at present in perfect health, and careful examination fails to reveal any trace of the tumor or any glandular enlargement.

In view of the fact that the diagnosis in such a case must be absolutely beyond question to render it of value as a proof of the specific influence of these toxines, a section of the tumor was removed under cocaine by Dr. Griswold and pronounced spindle-celled sarcoma, which diagnosis was further confirmed by Dr. E. K. Dunham and B. H. Buxton, pathologists to the New York Cancer Hospital, and lastly by Professor William Welch, of the Johns Hopkins Hospital.

Dr. John A. Wyeth said that he had had some experience with this method of treatment,—by accident, to begin with. That case was familiar to all. The man was still well, ten years since the treatment. It would be remembered that he had sarcoma of the abdomen, he was treated by injections of arsenious acid, and two or three days after these were abandoned he became infected,—not, he thought, by erysipelas, as there were no symptoms of erysipelas, but by pyogenic infection. He recovered and the sarcoma disappeared entirely. A careful microscopic examination was made by Dr. W. L. Wardwell and Dr. W. H. Welch, who pronounced it a spindle-cell sarcoma. Dr. Wyeth was using in all cases of sarcoma direct inoculation with pure culture of Fehleisen's coccus of erysipelas.

He had also once shown a case of enormous sarcoma which had started in the head of the humerus. He amputated the shoulder, and six weeks afterwards inoculated the sore with pure cultures of erysipelas, and produced well-marked erysipelas. He vaccinated him in this manner a second time. That patient was well to-day, being the only one of sarcoma for which shoulder-joint infection was done, which in his practice had not died of recurrence in six months. Sarcoma ought to be operated upon with the knife if possible, but before the wound had healed it ought, he thought, to be inoculated with erysipelas or its toxines. He told the patient there was a certain amount of danger in such inoculations, but that the danger of death from recurrence without it was far greater. He did not believe there was a case of sarcoma which ought not to be inoculated. It was sometimes difficult to give a patient erysipelas. In the case of one man with sarcoma he had failed entirely after six inoculations. The method most likely to succeed was to cause a superficial dermatitis by touching with the Paquelin cautery, wait for twenty-four hours, until the capillaries and lymphatics in the operative wound had become well congested, and then introduce the culture.

Dr. A. J. McCosh remarked that sarcoma sometimes disappeared in a strange way, even without the injection of erysipelas toxines. He recalled a case similar to Dr. Wyeth's. He amputated the shoulder, but a mass of disease larger than an orange remained, the diagnosis being confirmed by microscopical examination, and he urged the patient afterwards to submit to removal of the whole shoulder,—clavicle and scapula,—but she refused. The wound was about four months in healing. That was four years ago, and the patient was absolutely well to-day, although he had prophesied at the time that she would not live a year. Some of us had seen abdominal sarcoma, shown to be such beyond question by microscopic examination, disappear after exploratory laparotomy. This meant that we had yet a great deal to learn about sarcoma. Pathologists were cautious in making a positive diagnosis of this disease.

Dr. Curtis thought the percentage of cures obtained by any method of treating such an uncertain disease as sarcoma was important, and that the percentage of cures under this treatment had not been great enough to cover the occasional cases in which the disease disappeared without known reason, and the frequent cases in which an erroneous diagnosis of sarcoma was made. He had been disappointed, because the method had promised more in the beginning than it had since accomplished. It was within the bounds of possibility that we would have to go back to actual inoculation with erysipelas, as in the case reported by Dr. Wyeth. That part of the theory at least seemed to stand on a pretty firm basis, that erysipelas did sometimes cause absorption of malignant tumors. Later attempts with serums of all kinds had certainly been disappointing.

Dr. Coley, in reply, said, with regard to spontaneous disappearance of tumors of the connective-tissue type, that he was glad to hear the report of Dr. McCosh's case, for he had rather carefully reviewed the literature of the subject, and had found the record of no case of spontaneous disappearance where the diagnosis was well established by microscopical examination.

In the discussion of this subject before the Royal Gynæcological Society of London, June 23, 1894, Bland Sutton said, "He did not believe in the spontaneous disappearance of any connective-tissue or cancerous growths; he believed reported cases were based on clinical observation alone." In all the cases which Dr. Coley had inquired into, he had failed to find a microscopical examination to support the clinical diagnosis. [*Note.*—It should be observed that Dr. McCosh's case healed by prolonged suppuration.]

Regarding Dr. Curtis's criticism, that the percentage of cures by inoculation had been so small that there was reason to doubt whether it could be attributed to the treatment, it did not seem to him a scientific criticism. Of fourteen cases of inoperable tumors of the connective-tissue type, or spindle-cell sarcomas (not including the case shown to-night) which he had reported, all had shown improvement and seven had totally disappeared. In all of these cases the diagnosis had been clinically confirmed by a number of surgeons and microscopically by the most competent pathologists. Four cases had remained well over three years, which proved that it was not merely a temporary disappearance. The explanations might not be clear, as to the varying results in the different forms of sarcoma, but the clinical fact remained that a large proportion of cases of inoperable spindle-cell sarcoma have disappeared under the use of toxines of erysipelas and bacillus prodigiosus.

PREVENTION OF BLEEDING DURING AMPUTATIONS AT THE HIP-JOINT.

Dr. John A. Wyeth read a paper on this subject, for which see page 129.

Dr. W. W. Van Arsdale reported an additional successful case to the list given by Dr. Wyeth. The operation was done in July this year. In another case operated upon in the same manner one year previously, he found no necessity for removing the small piece of the femur connected with the hip-joint, consequently it was excluded from the category of hip-joint amputations. The man made a good recovery, owing to the employment of Dr. Wyeth's method, although the operation was done for a septic injury.

The case which he now wished to report was that of a boy of about thirteen years, who had sustained an injury of the knee about six months previously, which went on to suppuration. The patient was treated in Mt. Sinai Hospital, at first in another service. Dr. Van Arsdale undertook amputation at the hip as a last resort. The patient was so much wasted that he was not expected to live three days, but fortunately recovered, and was to-day in perfect health. The operation was done about the 1st of July. The technique was in accord with Dr. Wyeth's latest improvement, the ligature was applied in the manner which he recommended, the incision also, the bone was not divided, but was used for leverage and was taken out entire. The hæmorrhage amounted to nothing, being only a little oozing from cut muscles and skin after the removal of the ligature.

Dr. Lilienthal had seen Dr. Van Arsdale's patient while in the Mt. Sinai Hospital, and would say that he was not operated upon earlier because of profound pyæmia and the presence of metastatic abscesses throughout the body. In his own case, referred to in the paper, he had employed Dr. Wyeth's method, and was very much pleased with it. The patient made a prompt recovery, and in three weeks was about on crutches.

Dr. John D. Rushmore added another case, that of a girl of fourteen years, who had osteosarcoma of the lower end of the left femur, for which he had amputated the hip by this method. No symptoms of shock arose until the joint was opened, when the pulse ran up and it was necessary to inject salt solution into the rectum. Four pints were introduced within two hours. The pulse had remained very weak for several days, but ultimately regained its tone. The wound healed primarily, there being no suppuration except at two stitch-holes.

Dr. McCosh said that in one case in which he had employed this method it had answered every purpose admirably. There was no hæmorrhage, and practically no shock after the operation. He thought Dr. Wyeth's alteration of the original method, inserting the outer pin at a higher point, was a distinct advantage, and did away with the one valid criticism which had been offered to the method, —namely, that the rubber tube somewhat hampered the operator.

RECOVERY FROM APPENDICITIS WITH GENERAL SEPTIC PERITONITIS.

Dr. McCosh presented the appendix from a case of fulminating appendicitis. He said the interest in the case was in the history, not in the specimen. The patient was a girl, aged twenty-five years, of fine physique, a lady's maid, perfectly well up to three days before, at which time she had some pain in the abdomen, but gave little attention to it. The next day she did a hard day's work, packing over a dozen trunks, brought the family to the city, in the evening ate dinner, and about eight o'clock went to her room, complaining of some pain in the abdomen. Dr. James, about three hours later, found her suffering from some abdominal pain, slight tenderness in the lower part of the abdomen, temperature normal, pulse 90. The following morning she was a good deal worse, the pulse had increased, there was some temperature, some abdominal tension. He then sent her to the Presbyterian Hospital, where she was operated upon at 5 p.m., twenty-four hours from the beginning of the active symptoms. Dr. McCosh felt through the vagina a tumor which he took for a ruptured Fallopian tube. Laparotomy, however, showed that it was the appendix vermiformis in a state of gangrene. The peritoneal cavity contained about two quarts of pus and the intestines were coated throughout with thick layers of lymph. The cavity was washed out by some gallons of salt solution, strips of gauze were introduced, and the wound was left practically open. The pulse and temperature were lower to-day, yet the prognosis was exceedingly bad.

[*Note.*—November 28. The patient has continued to improve and is now convalescent.]

Stated Meeting, November 25, 1896.

The President, Frank Hartley, M.D., in the Chair.

AIR-DISTENTION IN SUPRAPUBIC CYSTOTOMY.

Dr. F. Tilden Brown read a paper on this subject. (See page 141.)

Dr. A. J. McCosh thought the paper very properly emphasized the value of distending the bladder with air. At first, when he had used the Davidson syringe, he had felt rather discouraged, for the result was not very satisfactory. But in three or four cases in which Dr. Brown had distended the bladder for him by the method described in the paper it had proven to be an admirable method. After the abdominal walls had been divided the bladder could be seen and felt to rise under the finger just as a toy balloon might do. He thought air had a distinct advantage over water. With its use there certainly was no need of the Petersen bag. In fact, he thought there were certain distinct disadvantages connected with the latter. The Trendelenburg posture was almost invariably employed by him, not because it was a necessity, but because it facilitated the operation in the average patient.

RESECTION OF INTESTINE FOR GANGRENOUS HERNIA.

Dr. William B. Coley presented a specimen and the following history of the case: Female, aged fifty years, right femoral hernia, strangulated eighty-four hours. The hernia had existed a good many years, but the patient had never worn a truss. There had been frequent attacks of incarceration, but reduction had always been accomplished by the patient or a doctor. Operation, September 8, 1896, at the Post-Graduate Hospital. There was a tumor in the right femoral region the size of a small egg. On opening the sac, which was greatly thickened and œdematous, a coil of very dark intestine was seen, very tightly constricted by the falciform portion of the crural arch. This loop was about three inches long. On cutting the constriction the bowel did not regain its color; it had lost its glistening appearance, and the serous coat was destroyed over a small area. The condition of the patient was fair; pulse 100; temperature 100° F., and it was thought wise to do a primary resection. Seven and a half inches of the bowel were removed and end-to-end suture was performed by means a double row of continuous right-angled (Cushing) Lembert sutures. The placing of these two rows of sutures took twelve minutes. The bowel was then replaced in the abdomen and the wound partially closed, leaving enough room for small gauze drainage. The patient's condition at the end of the operation was very good. She did well for three days, then gradually grew weaker. There was no passage from the bowels, and there was slight distention the fourth day. Temperature and pulse were but little elevated, and there was no suppuration in the wound. She gradually failed and died on the eighth day. A partial autopsy, with removal of the sutured portion of the bowel, showed that no leakage had occurred, and there was no evidence of peritonitis. Evidently there had been paresis of the bowel from prolonged strangulation.

TRANSACTIONS OF THE SECTION ON GENERAL SURGERY OF THE COLLEGE OF PHYSICIANS OF PHILADELPHIA.

Stated Meeting, October 9, 1896.

DR. J. WILLIAM WHITE, President, in the Chair.

A MODIFIED FORM OF ANTERO-POSTERIOR BRACE FOR THE TREATMENT OF POTT'S DISEASE.

DR. RANDOLPH FARIES presented two cases of Pott's disease with braces in position. The first wearing the antero-posterior spine brace frequently used; the second with a modification of this support devised by the reporter. His reasons for making a modification of this brace were to avoid any direct pressure upon the diseased area, thus excluding the possibility of aggravating the disease thereby; and to make the brace fit the contour of the spine in its diseased condition more accurately. His experience with this case led him to believe that the brace as modified gave greater comfort to the patient and firmer fixation to the vertebral column. The first case was one of four years' duration, accompanied by a large abscess which made its appearance just below and behind the great trochanter at the end of two years and a half, while the second was one of about one year's duration; thus far no abscess had appeared. The first case was practically cured, and looking at the seat of disease in the twelfth dorsal and first lumbar vertebra, very little deformity could be seen; the patient was able to move his spinal column in all directions, and there was no symptom remaining indicative of further trouble. The second case was not yet cured; but during the previous nine months there had been a marked improvement in the child's general health with a lessening of all symptoms, and there was nothing to suggest that an abscess would form. The seat of disease in the second case was the same as in the first.

A DEATH DURING THE ADMINISTRATION OF ETHER.

Dr. Joseph M. Spellissy reported the following case: A woman, who was very stout and between fifty and sixty years of age, had, in the umbilical region, a hemispherical swelling about six inches in diameter at the base. When first seen she was in a semi-somnolent state, apparently not suffering much pain, her pulse-rate being between 90 and 100, and of reduced force.

She spoke only Italian, and the history gotten through interpreters confined itself to the facts that she had had an umbilical hernia for many years; had been recently sick for some weeks, and had been very ill and in much pain for five days, during which the bowels had been locked—the hernia had not been reduced—and vomiting had set in.

Dr. Taylor, ambulance surgeon at the Pennsylvania Hospital, had used moderate efforts at reduction of the mass by taxis in the morning when the patient refused to be taken to the hospital. Later in the day Dr. Spellissy made a similar attempt and was also unsuccessful.

After a delay of some hours the patient consented to operation, and for which he had the assistance of Drs. John B. Roberts, Francis H. Packard, Dr. Gurney Taylor, and a trained nurse. The patient's condition was again examined, found without change, and ether anæsthesia begun.

The ether was administered a few drops at a time, and was taken after slight resistance very quietly; four minutes had not gone by and less than an ounce of ether administered when the patient appeared to be completely under and was about to be removed to the table for operation, when she vomited slightly, became a little blue, stopped breathing, and was pulseless. Her head was at once lowered and artificial respiration begun, to be momentarily interrupted by a prompt and skilful tracheotomy by Dr. Roberts,—under the supposition that the larynx might be blocked by vomited matter. Further efforts at resuscitation continued some twenty-five minutes but were futile.

At the post mortem, made on the following day, incision was made to the left of the mass, which was only delivered from the sack by repeated efforts of strong traction, involving the breaking up of some adhesions. The intestines were found in good condition, but several triangular masses of epiploic fat were purple from strangulation, the mesentery was infiltrated with fat. The heart was the subject of fatty deposition and degeneration, the muscle wall of the right ventricle was about a sixteenth of an inch in thickness, and fat entered into its composition. The arteries were atheromatous. The lungs exhibited hæmorrhagic œdema. There was no foreign material lodged in air-passages, pharynx, or larynx. The kidneys suffered from chronic parenchymatous nephritis.

Dr. Cattell, who made the autopsy, said he was convinced that the strangulated hernia could only have been relieved by operation, and that the condition of the heart and of the kidneys was such as to have led to the fatality following the administration of the anæsthetic.

Dr. White said there could be no question about the great desirability of more accurate prognosis in these cases as to ability of patients to stand ether, but our knowledge in that respect does not seem to have improved with great rapidity in late years. He had had one or two very narrow escapes. He recalled one case where he had fixed the following day for operation for vesical calculus. There was a very large stone, he knew, and he proposed to adopt the suprapubic method. The patient had the usual preliminary treatment. Dr. White saw him late in the afternoon. The next morning he was found dead in bed. If he had lived until noon he would probably have died on the table. But there was no reason to anticipate that when he paid him his last visit.

Dr. White had operated for prostatic hypertrophy and done castration on patients in the neighborhood of eighty years of age, who by reason of their age and obvious unfavorable condition would not have taken ether well. In these cases Dr. White employed local anæsthesia after the method of Schleich. There are other cases like Dr. Spellissy's where there is no reason to believe that the anæsthetic itself would be dangerous, which result fatally. That is a risk which at present we cannot guard against.

SUCCESSFUL CLOSURE OF HARD AND SOFT PALATE.

Dr. John B. Roberts exhibited a boy, nine years of age, upon whom he had operated a few months before for cleft of the hard and soft palate. The cleft in the hard palate was closed by lifting up muco-periosteal flaps from each side and suturing them in the middle line. This was done by an incision made close to the alveolar process on each side. For this purpose Dr. Roberts had had made a periosteal elevator of peculiar shape, which consisted of a blade curved on the flat with a rounded end. Both edges of this blade and the rounded end were sharpened. This instrument he had used in several cases of cleft palate with great satisfaction. The cleft of the soft palate was closed in the usual way with silk, after the tensor palati and levator palati muscles had been divided with a tenotome near the hamular process.

The boy had then been referred to Dr. G. Hudson Makuen for instruction in speech. Dr. Roberts felt that Dr. Makuen had done the boy much service by instruction in the use of his tongue and palate muscles. As is well known, these cases have difficulty in speaking because of the shortness of the soft palate and the difficulty in using the palate so as to shut off the naso-pharynx from the mouth. Dr. Makuen had advised division of the frænum of the tongue so as to give greater motion to that organ. He is now using what might be called orthopædic measures to stretch the soft palate in order to make it more flexible, and enable the patient to direct during speech the column of air coming from the lungs, either through the nose or mouth.

Dr. G. Hudson Makuen said that the case illustrated the fact that the mere correction of an anatomical deformity of the palate was not sufficient to restore entirely the function of speech. It does improve the character of the voice somewhat, but the habit of defective articulation will remain until broken up by some systematic training.

This training simply results in the gradual development of certain muscles of articulation which, owing to the anatomical deformity, have been unused hitherto.

In examining this case with Dr. Roberts, after his operation he found that the action of the tongue was very limited. This was due to the fact that the tongue is very little used in these cleft-palate cases, and all those sounds which are dependent upon this organ for their formation are either very imperfect or altogether wanting.

The tongue seemed to lie listless in the mouth, and it was with difficulty that the boy could touch the hard palate with its tip or protrude it beyond the margins of the lips. As a result of this inactivity the tip of the tongue was short and stumpy, and he suggested to Dr. Roberts for its elongation the division of the anterior fibres of the genio-hyoglossus muscle.

Under ether anæsthesia and with small scissors about a quarter of an inch of the mucous membrane on either side of the frænum was snipped through. Then, with the point of the scissors in the wound, the anterior fibres of the muscle were cut back for about an inch, and then, at Dr. Roberts's suggestion, were put in three stitches, drawing the mucous membrane together from the sides of the tongue.

This operation has resulted in adding about an inch to the freely movable portion of the tongue.

Another result of the cleft palate in this boy is that the pillars of the palate, especially the anterior ones, are too short, and they consequently prevent the necessary elevation of the velum palati during phonation and articulation. This shortening is increased somewhat by the fact that the pillars on either side have become adherent because of old inflammatory processes which have taken place in the tonsils.

For the removal of this condition he was gradually separating the pillars by means of small knives, which he had devised for this kind of work, the blades of which are set at nearly right angles to the handles.

At the same time he had been practising a kind of massage of the soft palate, with his index-finger kneading the palate, pushing it backward and upward and stretching it as much as possible; and he had instructed him to practise auto-massage, but as it is not a very pleasant operation, he feared he would not persist in it to any great extent.

He had also considered the advisability of snipping some of the fibres of the anterior pillars in the same way that the ophthalmic surgeon does tenotomy, to lengthen the muscle, and thus give greater freedom and scope to the movements of the palate.

In addition to these little operative procedures and simultaneously with them, he was having the boy put through a systematic course of speech-training. The exercises are carefully selected and designed to bring into use and to develop certain muscles which control the tongue, the palate, and lips.

In this way he believed for this boy could be obtained nearly, if not quite, perfect articulation without the aid of any artificial contrivance. He has already improved wonderfully in speech.

THE DIAGNOSIS AND TREATMENT OF SURGICAL AFFECTIONS OF THE KIDNEYS.

DRS. J. WILLIAM WHITE and ALFRED C. WOOD read a paper with the above title, which is published in full on page 1, January number, 1897.

Stated Meeting, November 13, 1896.

J. William White, M.D., in the Chair.

RHINOPLASTY.

Dr. Joseph P. Tunis read a paper upon "A Plastic Operation on the Nose," in which a phalanx from a finger had been transplanted; he exhibited the patient.

Dr. White said that the principle of the operation was old. He had never himself tried to make a nose or a part of a nose from any other portion of the body, excepting that immediately adjoining the nose. He had used flaps from the abdomen to make a new cutaneous covering for the hand for extensive burns or deformity, cutting them loose after some weeks interval.

Dr. White elicited the statement from the patient that when the stump, from which the finger was removed, came in contact with anything she felt it in the transplanted finger on her nose and *vice versa.* In reply to a query from Dr. H. A. Slocum, Dr. White said this phenomenon had not been marked in his cases of plastic surgery, although he could have understood such an occurrence when the tissue had been removed from adjacent areas. In such cases there is probably some immediate nerve connection. Dr. White thought in Dr. Tunis's patient the sensation complained of was a purely subjective thing with its origin very likely in the imagination, although it would not be safe to dogmatize about it.

URETER INVOLVED IN APPENDICAL INFLAMMATION.

Dr. W. H. Noble reported the following case: A man, aged twenty-three years, had been the subject of frequent attacks of pain in the region of the right kidney, resembling nephritic colic. During these attacks, which at times lasted but a few hours, though at other times they persisted for a day, or even as long as three days; there was invariable nausea and vomiting, with agonizing pain radiating down the right ureter, retracting the right testicle, profuse perspiration, pulse feeble, and all the concomitant symptoms present in the passage of renal calculus, with the exception of hæmaturia. The patient said that on more than one occasion he had passed sand in his urine. This, however, did not come under the narrator's observation, and repeated examination of the urine during three years proved to be negative.

When first seen these attacks occurred once every two or three months, though they had been present for a number of years antedating that time. They became more frequent, however, until the time of operation, when they were occurring as often, perhaps, as once in three weeks. They were not associated with any indiscretion in diet, nor did the initial symptoms suggest such an explanation for his continued illnesses. The onset was always sudden and paroxysmal.

Aside from the condition recounted above, he had good health.

Diagnosis of probable stone in the pelvis of the right kidney was made, and operation done in St. Joseph's Hospital at the earnest request of the patient, on June 7, 1895. The kidney was exposed through a lumbar incision and drawn out, but careful exploration failed to reveal the presence of stone either in its body or pelvis. A finger was then passed into the wound along the course of the ureter and at the farthest point that could be reached a thickened mass was felt, apparently indurated tissue, which suggested the possibility of trouble lower down, but out of reach except by an incision longer than it was deemed advisable to make in that situation. The kidney was therefore secured in its place by three sutures of silkworm gut, and the incision in the back closed and sealed with collodion. He was then turned on his back and the abdomen opened by an incision such as is ordinarily employed in operation for appendicitis, but somewhat nearer Poupart's ligament.

Exploration of the abdominal cavity revealed a very long and thickened appendix, pointing upward and backward with its tip adherent to the peritoneum over the right ureter. These attachments were broken up and the appendix removed.

The patient made an uneventful recovery and has since had no return of his malady.

ILEO-CÆCAL HÆMATOMA SIMULATING APPENDICITIS.

Dr. Noble also reported the following case: A woman, aged twenty years, whom he had seen in consultation with Dr. Isaac Leopold on the afternoon of August 27, 1896. Several years before she had had typhoid fever. Two years before she was subjected to an operation for hæmorrhoids and prolapse of the rectum. She had always suffered from obstinate constipation, but aside from these troubles her health had been good. For three weeks she had been assisting in nursing a relative in an attack of typhoid fever. Two days before she had, while shopping in the city, been seized by a sudden and violent pain in the right iliac region, which was so severe that she was sent home in partial collapse. The following day the pain became localized, but without any improvement in her general condition, and when seen, twenty-four hours later, her temperature was but 97° F. The muscles in the region of McBurney's point were rigid and tense, and on pressure the pain was exquisite. Inquiry elicited the fact that she had been unusually constipated, but otherwise, except for the fatigue incident to her attendance on her relative, she had been in her usual health. Examination by rectum revealed a rounded mass in the region of the ileo-cæcal junction, apparently the size of a large orange. Appendicular abscess was diagnosed and immediate operation advised. The case was removed to Union Mission Hospital and the operation made two hours later. No abscess could be found, but exploration showed a mass in the wall of the intestine at the ileo-cæcal junction. The incision was enlarged and the intestine carefully drawn outside, when it was found that, whilst the appendix had been subject to catarrhal thickening with evidence of former mild attacks of inflammation, and also contained three fæcal concretions, it was not the cause of the trouble. The mass felt was a hæmatoma in the walls of the ileum and cæcum, with one cornu enclosing, though not intimately, the base of the appendix whose tip was adherent to the peritoneum covering the large gut.

The effused blood was immediately beneath the peritoneum and extended from a point in the small intestine about an inch above its junction with the cæcum for four inches along that viscus and over two-thirds of its circumference. No definite point of the tumor's origin could be found, and the only theory that suggested itself as a cause was a possible ulcer low down in the ileum. The appendix was removed and the intestines returned without further interference.

The patient made an uneventful recovery. The only unusual precaution in treatment observed being a prolongation of the period in which restricted diet was given with no interference with the bowels for forty-eight hours.

After the operation inquiry was made for the history of possible injury,—a knock against the corner of a piece of furniture, strain incident to lifting or dressing the typhoid patient, and such like, but proved to be negative. In view of her attendance on typhoid fever and the possibility of infection from the same source, her dejections for three days were given to Dr. Frank Massey, pathologist of the hospital to be examined for the presence of typhoid-fever bacilli. The cultures made by him showed that the only micro-organisms present were the bacillus coli communis, the staphylococcus pyogenes aureus and albus.

These two cases, it seemed to him, were worthy of note because they both point out possible sources of error in the diagnosis of appendicitis. In the one case, the symptoms which were long and carefully analyzed and well considered, pointed to trouble in another viscus, whilst in the other they pointed to the appendix in apparently unmistakable signs; yet the appendix was innocent.

Dr. White recalled the fact that he had made the reverse mistake that Dr. Noble did in the first case, having diagnosed as appendicitis a case which was really one of acute ureteral obstruction. This was the only case in which he had operated for appendicitis and found an absolutely unmistakably normal appendix. Dr. Noble's case was one in which all the symptoms pointed to the kidney, and yet the appendix was at fault. The other case is almost unique. Dr. White said he had never heard of a case of hæmatoma with no traumatic cause, situated just at the ileo-cæcal junction and simulating appendicitis as closely as this did. He thinks the cases mentioned should make surgeons a little more careful of talking of the ease with which appendicitis may be diagnosed. He believes it is unsafe for the profession at large to assume that appendicitis is a condition which nothing else simulates and always easily recognizable.

NEPHRECTOMY FOR PYONEPHROSIS.

Dr. W. H. Noble presented again the man whom he had shown to the society at its April meeting (see Annals of Surgery, August, 1896, xxiv, 233). At that time he had been subjected to removal of the left cornu of the hyoid bone, on account of non-union of a fracture caused by a fall, in which he struck his neck across the edge of a water-trough. He had previously suffered an amputation of the left thigh.

Since last spring he has been struck by a gate, at a railway crossing, where he was employed as watchman, and sustained a fracture of the sternum. On September 7, 1896, he had been seized with a violent chill which lasted for several hours, attended with hæmaturia, associated with great pain and soreness over the right kidney. During that time he was obliged to micturate frequently. With the exception of the bloody urine, the succeeding two days were a repetition of the first. There was great pain in the region of the right kidney, frequent chills, nausea, and vomiting. When first seen his temperature was 104$\frac{4}{5}$° F. Examination over the kidney occasioned exquisite pain. He was removed to the Union Mission Hospital, and the following day operated on for acute abscess of the kidney. In the interim, examination of his urine was made, which showed the presence not only of pus, tube-casts, and traces of blood, but epithelium from the pelvis of the kidney. The kidney was exposed by a lumbar incision and drawn outside of the body. It was greatly enlarged and showed evidence of a high degree of inflammation. Three exploratory punctures were made with a trocar. Blood intermixed with pus flowed through the canula when the third was done. The vessels were ligated separately; the ureter drawn well up, ligated, and dropped back into its place. The wound was then freely irrigated with normal salt solution. The deep muscular structures were brought together with three silver wire sutures and the skin closed with interrupted sutures of silkworm gut.

A very interesting feature of this case was the rapid fall in temperature after operation. He went to the table with the thermometer showing 104$\frac{3}{5}$° F., but within six hours after operation it had dropped to normal, and not until an accident, which occurred seven days later, did it rise above 99° F. The secretion of urine seems also to be phenomenal. This man had had nearly one-fourth of his body cut away; and yet, with but one kidney which had been subjected already to the influence exerted by very high temperature for six days, he, in the first twenty-four hours, secreted twenty-nine and a half ounces of urine. The succeeding twenty-four hours thirty-nine ounces were passed. The following day the amount was forty-one and three-fourths ounces. The fourth day thirty-four ounces. The fifth day the amount rose to forty-three ounces. Two days later, the seventh day, fifty-four ounces. After this time, while he was in the hospital, he regularly passed in the neighborhood of fifty ounces of urine daily; and, according to his own account, since he has gone to his home, the amount passed is practically the same.

For some reason, best known to himself, at the close of the first week, he pulled the dressing off, and with his fingers scratched and pulled at the wound. Infection resulted, so that on the eighth day, when the sutures were removed, the line of incision for four inches was found to be suppurating. The wound was then completely opened and packed from the bottom. It is now practically healed. Examination of the removed kidney showed it to be ramified with septic infarcts, and filled with multiple minute abscesses.

Dr. White remarked that the case had several points of interest: as an unusual remote result of accident, with no apparent renal injury at the time, but later traumatic stricture, obstruction, ascending infection by way of the ureter, abscess, and then acute symptoms that certainly justified the operation.

It was a large kidney to have been removed easily by the lumbar method. The majority of surgeons to-day are coming to prefer, where it seems an open choice, the abdominal incision for nephrectomy, particularly where there is reason to believe that the kidney is of unusual size. The history of the amount of urine secreted made no mention of the character of the urine. The evidence goes to show that soon after nephrectomy, even when the remaining kidney is healthy, it is subject to hyperæmia, or intense congestion which sometimes very closely approaches true inflammation.

Dr. Massey, who made the examinations of the urine for Dr. Noble, stated that in the beginning there was albumen for two days, after that there was no albumen at all. After the first week the urine showed a large amount of indican and acetone; after the second day the urea came within a very few degrees of being normal. The first time he examined he found it was 1½ per cent., then 2½ per cent., and then it averaged 2 per cent. for the rest of the time. He examined it every day for twelve days. At the end of the first week, except for a little pus, the urine was normal.

CYSTOTOMY FOR MULTIPLE VESICAL CALCULI.

Dr. W. H. Noble reported the following case: A man, aged fifty years, was first seen four years ago, at which time he had an enormous left scrotal hernia extending nearly to the knee, and a stone in the bladder. The desire to micturate was constant, the effort frequently being made, he informed me, as often as seventy-five times in twenty-four hours. The urine passed was continually mixed with a very high percentage of stringy mucus, blood, and pus, and micturition was only accomplished with great effort. He had been in bed for more than a year.

The hernia first appeared while he was in the Federal army, in the cavalry service, during the late war between the States. Until four years before the time when he first was seen the hernia had given him but little annoyance, but at that time, presumably, stone began to form in his bladder, which occasioned straining of the abdominal muscles in the effort to empty the bladder of urine. This continued with increased severity until the time stated, when he presented the condition recorded above. He was operated on for stone a few days later by the perineal route. A large, soft calculus was found, which was readily broken up with forceps and removed. He did well after the removal of the stone, and four weeks later a second operation, after the method of Bassini, was made for the radical cure of the hernia.

Owing to the enormous hernia which had to be dealt with, and the widely-dilated abdominal ring, it was thought wise to remove the left testicle with its cord, and the scrotum was cut away. The suturing material used was silkworm gut. His recovery was without incident, and he was able at the end of three months to resume his occupation, that of a travelling salesman. During the next three years he had no trouble either with his bladder or hernia, but at the end of that time he again experienced a return of the bladder trouble. The old difficulty in micturition returned, and with it all the symptoms of vesical calculus. The efforts made to pass urine forced the hernia down again, but only to a moderate degree.

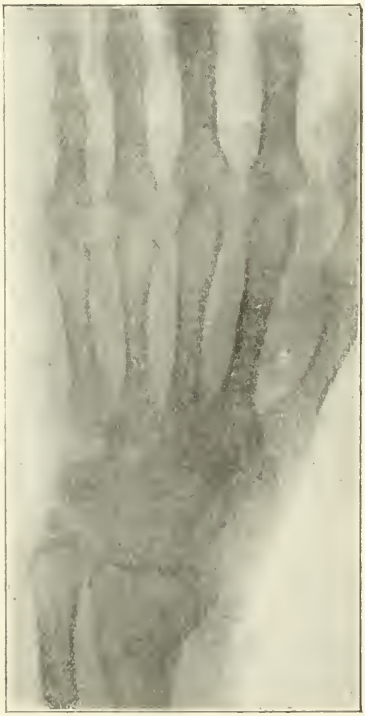
He grew rapidly worse and was soon confined to the house, the greater part of the time to his bed, and was finally again operated on September 20, 1896. The perineal route was again chosen, and at one sitting sixteen stones were removed, the whole weighing 2461 grains. For two weeks he did well, and fair hopes of his ultimate recovery were entertained, but during the succeeding week he developed uræmia, and died on the twenty-first day.

In the literature examined on the subject of "multiple calculi," numerous records of the removal of large numbers of stones are found, but no account of their individual or combined weight. Dr. Physick removed from the bladder of Chief-Justice Marshall 1000 stones, but he makes no allusion to their separate weights or size.

Kerr, of Canton, China, in over 1400 operations, speaks of a number of cases of multiple stone, but in one case only, that of a young man who had a tumor under the penis, with a small opening into the urethra, in which he found 291 calculi, does he give any weights, contenting himself with such statements that four of the stones were the size of pigeon eggs.

SKIAGRAPH OF THE DEFORMITY FOLLOWING FRACTURE OF THE LOWER EXTREMITY OF THE RADIUS.

Dr. John B. Shober presented a skiagraph (see figure) taken for him by Professor Goodspeed, of the University of Pennsylvania, illustrating the well-known silver fork deformity of a badly-treated fracture of the lower extremity of the radius. The patient consulted him thirteen weeks after the date of the injury, prepared to submit



Skiagraph showing deformity of the radius.

to an operation if necessary in order to regain the function of the hand and the wrist-joint.

She stated that on the day of the fracture a splint was applied with a tight bandage, and that the dressing was not changed for six weeks, although the hand and fingers became much swollen and the finger-nails blue. She experienced a great deal of pain during these weeks, and when the dressing was finally changed there was an extensive excoriation just below the styloid process of the ulna. Upon examination he found complete ankylosis of the second phalangeal joints of the middle and ring fingers and partial ankylosis of all the other phalangeal joints. There existed the typical silver fork deformity and almost complete ankylosis of the wrist-joint. The wrist and fingers were flexed, and the skin atrophied, wrinkled, and glossy, showing impaired nutrition.

In the skiagraph all the bones are very clearly and sharply defined. The shadow is deep at the edges and in the body of the shafts of the long bones, and fainter in the region of the articulations where the bone is less dense owing to the cancellated structure. Another general point of interest is found in the very fine longitudinal lines covering the metacarpo-phalangeal joints extending less defined along the shafts of the phalanges and becoming more marked over the phalangeal joints. These shadows are doubtless thrown by the dense extensor and flexor tendons.

In all skiagraphs of joints a whitish line of demarcation is usually to be found between the articulating surfaces of the bones entering into the formation of the joint and the interarticular cartilages.

In this picture it is interesting to note that the whitish line of articulation is absent in the completely ankylosed joints,—namely, the second phalangeal joints of the middle and ring fingers; also that the shadow around these joints is deeper than that around the other joints, indicating a possible bony ankylosis.

If this observation is correct, it may be that we have here indicated a useful method of diagnosis between false and true ankylosis.

By far the most interesting feature, however, of this picture is the general distortion of all the bones entering into the structure of the wrist-joint.

The distal fragment of the radius has become tilted radially and impacted upon the proximal fragment, and the articulating surface of the radius has receded at least one centimetre from the normal position. As a result of this the styloid process of the ulna has been torn away from the shaft and lies apart between it and the pisiform bone, which is seen beyond it lying in the shadow of the cuneiform, and that the head of the ulna projects beyond the radius. All carpal bones are tilted out of the normal position, having followed the distal fragment of the radius. The trapezium, articulating with the metacarpal bone of the thumb, is seen lying below and in the shadow of the trapezoides. This is due to the position of the hand when the picture was taken, the thumb being partially flexed upon the palm.

The picture shows the importance of extension as well as flexion and abduction in effecting a reduction of this fracture.

The question of resection of the ulna is worthy of consideration in this connection.

Dr. White said he thought Dr. Shober had made the only application of mechanics to the case that would be likely to prove applicable. He should not feel himself that there was any clear indication for operation to be derived from the skiagraph. He approved of Dr. Shober's surgical judgment in declining to recommend operation.

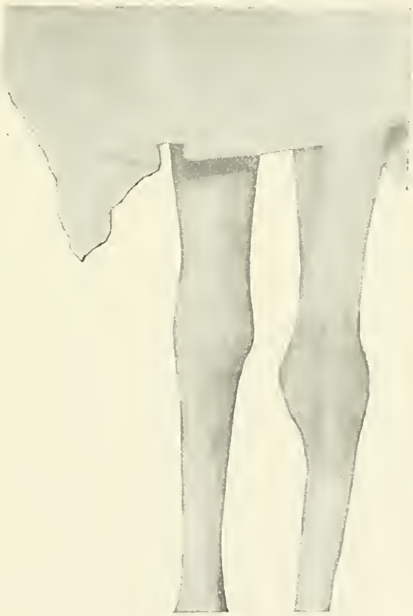
He could conceive, however, in a more advanced case, with great deflection towards the radial side and still greater projection of the ulna, that some straightening might be obtained by ulnar resection. Excellent results have been obtained in some analogous conditions following Pott's fracture. Dr. White saw Sir Joseph Lister operate in such cases and followed the cases in his wards, and later did the operation himself, and both cases were greatly benefited, the conditions having been somewhat analogous, marked eversion of the foot, in which all the relations were disturbed and in which breaking up the adhesions, chiselling away the bone occupying the interosseous space and restoration of the foot to its normal line were successful, being followed by great functional improvement.

The skiagraph does not show that there is any deformity resulting from interference with the interosseous space ; it is practically a subluxation of the metacarpal bones with distortion following and the deformity of a fracture.

Dr. W. Barton Hopkins said he did not think the ulnar trouble thrusts the hand to the radial side. He thinks it does not exercise as much influence as the fibula does on the foot. He doubts whether it would allow the hand to tilt into its normal position. Dr. Hopkins took a plaster-cast of a hand which forty years before had been subjected to resection of the radius. The hand was drawn almost one-third to the radius, showing that the ulna does not exercise any influence in keeping the equilibrium of parts.

CONGENITAL ABSENCE OF BOTH PATELLÆ.

Dr. William Barton Hopkins exhibited to the section the photographs and a plaster-cast of a case of congenital absence of both patellæ, taken from a man, aged sixty-eight years, who had been admitted to Pennsylvania Hospital with a fracture of the right femur and left clavicle. Examination of the lower extremities revealed on both sides the tendon of the quadriceps extensor inserted into the tuberosity of the tibia without the intervention of the sesamoid bone. The condition of the parts was slightly masked in



Hopkins's case of congenital absence of both patellæ.

the right limb by the infiltration of the integument incident to the fracture of the thigh. Upon the left limb it was easier to demonstrate the remarkable deformity existing. As the limb rested quietly upon the bed, the knee-joint appeared very broad and flat, the tuberosity of the tibia was prominent, both limbs were emaciated. An effort to lift the left foot from the bed, keeping the leg extended, brought the tendon of the quadriceps plainly into view extending from the lower third of the thigh to the head of the tibia. Under such good control were the patient's muscles that he kept the limb in this position while the plaster-cast was taken, particularly while the plaster of Paris of the upper mould was setting. With the leg flexed completely on the thigh the tendon was entirely lost to sight. The condyles of the femur appeared unusually prominent and the head of the tibia could be plainly felt. Careful examination of the right limb showed the conditions to be quite similar. The patient had double varus and the metatarso-phalangeal joints were distorted, presumably from arthritis deformans. He stated that he walked perfectly well, to use his own expression, "could walk as far as anybody" until he had rheumatism.

This case so far as Dr. Hopkins knew had never been reported, he had collected reports of fifteen other cases: one American, five English, four French, three German, two Italian. In nine of these the deficiency was observed in both knees, while in six, one knee was affected. As no reference could be found which tabulates the cases recorded, he had compiled the following list:

CASE I.—Vincent Duval, "Traité pratique du Pied-Bot," Second Edition, Paris, 1843, 8vo, p. 94. "At present there is in my Orthopædic Institution an infant of sixteen months, who was born with well-marked equinus of both feet. The flexor muscles are strongly retracted and the toes flexed on themselves. There exists in this child a singularity of development that I never before observed,—that is, the absence of both patellæ."

CASE II.—Brodhurst, B. E., "Nature and Treatment of Club-Foot," London, 1856, 8vo, p. 32. "H. T., aged two months. There is valgus of the left foot of the third degree; and varus of the right, of the second degree, together with powerful retraction of the quadriceps extensor cruris, through which the leg is slightly bent forwards upon the thigh. After very careful examination, I was unable to discover any trace of a patella. They were both absent."

Case III.—Lane, "Congenital Absence of the Right Patella," *Lancet*, London, 1858, I, 63. "The existence of a double equinovalgus in a little boy in this hospital, eight years of age, we do not so much bring under the notice of our readers for the deformity, as to illustrate a peculiarity of very much rarer occurrence; we allude to the congenital absence of the right patella. The lad looks very much younger than his real age, . . . the knee-joint appears perfectly formed, but no trace whatever is visible of the sesamoid bone. The records of surgery show but very few examples of the deficiency of this particular bone."

Case IV.—Friedleben, *Jahrbuch für Kinderheilkunde*, Wien, 1860, III, 222. ("Anomalien der Patellæ.")

Case V.—Hilton, "Case of Non-Development of both Patellæ." *Lancet*, London, 1862, II, 497. "The child (a female) was born in 1835 at the full period of gestation. . . . I saw the child at Guy's when she was three months old. Her legs below the knee could be directed by external aid into any position, backwards, forwards, or laterally, without pain. She could flex the legs completely. No patella or distinct ligamentum patellæ could, on most careful examination, be discovered by the surgeons to the hospital, or by myself, in either knee. Subsequently Sir Astley Cooper examined this child's knees with the same result. . . . This child came before me again when she was about twenty-two months old. . . . There were no patellæ at that time,—not a rudiment to be felt. . . . When three and a half years old she had no patellæ, but at about four years very small ones, like peas, manifested themselves. . . . At between six and seven years of age I examined the patient. She could walk upright but not with perfect steadiness, . . . and it was not until she was ten or twelve years old that she appeared firm upon her legs. I saw her in January, 1862 [twenty-seven years old]. She is short in stature, capable of walking any reasonable distance, and is upon her feet the greater part of the day. The patellæ are small, but well-shaped and in good position."

Case VI.—Jolicœur, "Absence de Rotules," *Bulletins de la Société Médicale de Reims*, 1873, XII, 67.

Case VII.—Labbé, "Absence congénitale de Rotules," *Bulletin de la Société de Chirurgie de Paris*, 1874, III, 3 S., 508. Mr. Labbé presented an infant, aged fifteen days, showing congenital absence of the patellæ complicated with a double astragalus and a distortion of the legs from without inward. Most of the members of the society counselled putting off treatment in this case until the child had reached the age of one year.

CASE VIII.—Körte, "Zwei Fälle von angeborenem Mangel der Patella," *Deutsche Zeitschrift für Chirurgie*, 1877, VII, 69.

CASE IX.—Hartigan, J. F., "Congenital Malformation of the Knee-Joint," Washington, D.C., 1880, pp. 8.

"Florence S., colored, born December 5, 1878. . . . This little girl performs all her functions naturally, except the voluntary motions of the left lower extremity. The left leg and foot instead of flexing on the thigh by concentration of the biceps and semi-tendinosus and semi-membranosus, could not be moved backward after the tibia and fibula were in the axis of the femur; but at the child's volition, or with the gentlest pressure, the leg and foot bent forward against the quadriceps, the sole of the foot presenting upward, the toes pointing into the groin, in which position it is generally maintained. . . . The condyles of the femur appear to be natural in their development and no deviation from the normal form of the tibia and fibula could be observed. . . . I invited Dr. George A. Otis, of the United States Army, to examine this extraordinary example of malformation. On December 10, 1878, a careful inspection was made. . . . Dr. Otis agreed with me as to the absence of the patella . . . and the probability that the singular condition of the articular structures had supervened at an early period of intra-uterine life."

CASE X.—Dukhnowsky, "Case of Absence of the Patella," *London Medical Record*, 1885, XIII, 299. "Dr. Dukhnowsky, of Odessa, records ("Proceedings of the Odessa Medical Society," No. 11, 1884, p. 161) the case of a soldier, aged twenty-two years, who complained of difficulty experienced by him in walking and of general weakness and fatigue of his lower limbs. Examination detected a complete absence of the right patella, and a rudimentary state of the left, the latter presenting a cartilaginous body about the size of a small almond. . . . Flexion of the knee-joints was extremely free, the patient being able, without effort, to touch his buttocks with the heels. . . . He was ultimately discharged as unfit for military service."

CASE XI.—Bosquet, *Bulletins et Mémoires de la Société de Chirurgie de Paris*, 1885, N. S. XI, 354. Joseph G., court clerk, aged twenty-one years, exempted from military service on account of congenital retraction of the biceps.

On examining the lower limbs of this young man, the muscles of which are well developed, we were surprised at the particular conformation of the thighs, rounded like those of a woman.

G. remarked that his knees were not constructed like other people. At a first view we found only a slight genu-valgum. On touching the knees we failed to find the patellas; with a more careful examination, however, we were able to find vestiges of the bone deviating to the outside and applied to the outer face of the external condyle; that of the left side being about the size of a plum-stone, the right slightly more developed. The knees are rounded, the cul-de-sac of the synovial is normally formed, the condyles of the femur can be outlined under the skin, and on depressing the soft parts, the finger penetrates deeply into the interstices of the condyles. When the patient bends his leg the protuberance of the condyles is marked, and it is then possible to explore a part of their surface.

G. says that he is an excellent walker; being a clerk of the Provincial Court he has often made in his rounds from thirty to forty kilometres without feeling excessive fatigue.

Case XII.—Bernacchi, "Un Caso di apparente mancanza congenita della Rotula," *Archivio di Ortopedia*, Milano, 1891, VIII, 12–25.

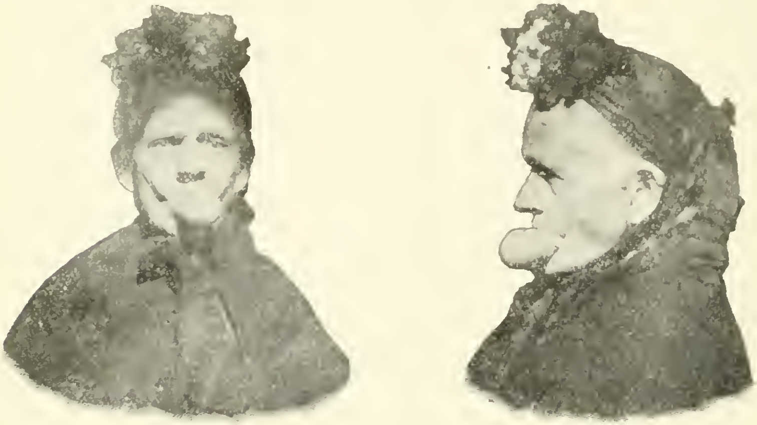
Case XIII.—Railton, "Congenital Absence of both Patellæ," *British Medical Journal*, London, 1892, I, 969. "Dr. Railton exhibited a girl, aged nine months, in whom both patellæ were completely absent. There was a slight genu-valgum in the left leg and a tendency to varus in the left foot. The left hip- and knee-joints, particularly the latter, were so lax that the left foot could be turned outwards completely round so as to point directly backwards. The right leg could not be so treated. The child was healthy in other respects, except for the presence of slight rickets."

Case XIV.—Salaghi, "Un Caso di assenza congenita della du Rotule," *Archivio di Ortopedia*, Milano, 1894, XI, 222–230.

Case XV.—Hopkins, case reported, 1896.

LINGUAL LIPOMA.

Dr. William Barton Hopkins reported the case of a woman, aged seventy-five years, who was admitted to the Pennsylvania Hospital October 16, 1896, for a large tumor of the tongue of twelve years' standing. The tumor which was five and fifteen-sixteenths inches in circumference, nearly spherical in form, was readily dissected out. No hæmorrhage occurred, and the wound healed readily, and the patient was discharged from the hospital.



Front view. LINGUAL LIPOMA. Side view.

Examination of the growth showed it to be, as its gross appearance indicated, lipoma. The case is interesting, as the tongue is probably one of the rarest seats of fatty tumor.

EDITORIAL ARTICLES.

KRUMM ON NARCOSIS PARALYSIS.

THE recent discussion in the German Surgical Society of the methods of administering various anæsthetics and the occasional sequelæ to their use has led Dr. Ferdinand Krumm to make a careful study of over 1700 cases in which a general anæsthetic was given in the surgical service of Professor Bessel Hagen in the General Hospital at Worms. It was found that certain nerve lesions occasionally developed after narcosis, and these rather unusual sequelæ he has classified and presented in a brief monograph upon the subject.[1]

Narcosis paralysis is the name applied to those paralyses which first appear after the administration of a general anæsthetic. This common origin seems to justify their classification into a distinct group of nerve lesions, although no portion of the body appears to be exempt, and individual muscles or groups of muscles may be affected. The paralysis is not dependent upon the kind of anæsthetic employed, nor upon the mode of administration.

According to the site of the lesion these paralyses may be divided into two great classes, peripheral and central.

The literature of the subject is more extensive than is commonly supposed, and in the monograph no less than forty-eight writers are cited who have contributed to our knowledge of the subject within the past few years.

Central paralyses are so rare as to be of little practical importance. The peripheral or "true" narcosis paralyses are quite analogous to those forms of sleep or birth paralyses occurring in the area of distribution of the brachial plexus or individual nerves arising from the plexus. Such a pressure paralysis may develop in those cases in which the arm is strongly drawn upward and outward during narcosis. This occurs most frequently in laparotomies to get the arm out of the way of the operator or his assistants, or during operations, such as amputation of the mammary gland, where it is desirable that the contents of the axilla should be thoroughly removed. In this latter class of cases the resulting paralysis must not be confounded with those lesions due to a direct injury of the nerve in the wound during the operation itself.

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[1] Ueber Narkosenlähmungen, by Ferdinand Krumm, Worms; Volkmann's Sammlung klinischer Vorträge, No. 139, Leipzig.

Opinions vary as to the mode of pressure and the exact place where it is usually exerted. Braun believes that pressure may occur at many places. Nonne, Hoodemaker, Bernhardt, and others think that when the arm is extended and abducted the brachial plexus is compressed between the clavicle and the transverse process of the sixth or seventh cervical vertebra. Similar paralyses have been observed in persons sleeping upon the extended arm, and also in children born with the arms above the head.

The direct pressure of the head of the humerus in the axilla may be a powerful factor. It often happens that raising the arm above the head will stop the radial pulse; the same pressure that compresses the axillary artery may easily injure the nerve-trunks. It has also been shown by Kron that when the arm is thus raised above the head and rotated externally, the median nerve is submitted to extreme tension as it passes over the head of the humerus. If the elbow be bent and then powerfully supinated the ulnar nerve suffers in a similar way.

Büdinger has recently made a series of experiments upon the cadaver for the purpose of demonstrating the manner of injury more exactly. His investigations seem to show that pressure is most apt to occur from the twisting of the clavicle upon its long axis and pressure upon the nerve-trunks as they lie upon the first rib. The fifth and sixth cervical nerves are most apt to suffer, for those lower down slip more easily out of the way. His dissections showed that the more the head was bent away or backward from the uplifted arm the less the tension became. This fact is of practical value, for if, during narcosis, choking or vomiting occur, the head can be supported on a small pillow and bent away from the side involved in the operation. In emaciated persons the absence of fatty padding in the axilla favors the occurrence of such injuries. Krumm himself has also made similar experiments, and is of the opinion that the views of both Büdinger and of Nonne are correct, and that the difference in their conclusions was due to the different relations of the clavicle to the wall of the thorax, which varies in the age and development of individuals.

Whatever may be the view as to the cause of the pressure, all the writers agree as to its exact location; this is at the place where the fifth and sixth cervical nerves emerge from between the fibres of the scaleni muscles.

In those cases in which individual nerves arising from the brachial plexus are injured sufficiently to destroy their function, the etiology is somewhat different. Various causes result in this form of paralysis. If the arm be not properly supported during narcosis, its own weight pressing upon the edge of the operating table has caused paralysis in many cases. If the Esmarch bandage or tube be used, and improperly placed, or applied too tightly, or left on the limb too long, paralysis may result. Such accidents are much more likely to occur in thin persons or in children.

In the 1700 cases studied by Krumm four cases of narcosis paralysis occurred. A summary of these is as follows:

Case I.—Female, aged thirty-eight years. Amputation of the left breast, with removal of the fat and glands of the axilla. During the operation the arm was strongly extended and abducted. During the next twenty-four hours severe pain began in the left shoulder. On the sixth day the first dressing was done. Healing *per primam*. It was found, however, that a complete paralysis of the left arm had developed, and also a partial paralysis of the muscles around the shoulder. After six weeks of treatment the use of the arm was almost completely restored.

Case II.—Female, aged fifty-four years. Abdominal section for the relief of salpingitis and other pelvic complications. Trendelenburg's position during a long operation. The arms were held above the head during this time. Paresis of the deltoid and upper arm muscles developed at the end of a week, but no anæsthesia. The paresis slowly improved, and at the end of several weeks had disappeared.

Case III.—Male, aged twenty-two years. Gunshot wound of the abdomen. Wounds of gall-bladder, liver, and right kidney. Operation lasted one and a half hours. The arms were drawn above the head to get them out of the way. The following day the patient could not move the right arm at all. The paralysis gradually improved, and at the end of ten weeks the deltoid and rhomboid muscles were still paretic, but the forearm had practically recovered.

Case IV.—Female. Tubercular hygroma of carpus. An Esmarch bandage was kept on arm during a rather difficult dissection. A few days later it was noticed that the patient could not extend the fingers or hand, though flexion was undisturbed. There was a slight weakness of the biceps. Function was re-established after several months.

In all of these cases the treatment consisted in hot and cold baths, passive motion, massage, and the use of the faradic and galvanic currents.

In those cases where the lower nerves of the plexus are involved the Klumpke type of paralysis is developed. In the more common cases the upper nerves are the site of injury, and then the form of pressure paralysis described by Erb and Duchenne is produced. The paralysis is rarely so complete that the patient loses control of the fingers. It is to be noted that in the Klumpke type there is often either an injury of the communicating branch of the first dorsal nerve, or an accompanying neuritis of the certain nerves of the eye, so that myosis, partial closure of the eyelids, retraction of the bulb, and flattening of the cheek have been accompaniments of the more evident paralysis of the arm.

Various degrees and areas of paræsthesia are often observed, particularly in the areas of distribution of the axillary, ulnar, and musculo-cutaneous nerves.

The pathologic lesions vary greatly in severity. In mild cases disturbances of circulation occur which are soon readjusted. More serious lesions cause a descending degeneration and atrophy of the nerve fibres.

It is evident that the use of the electric current as a method of determining the exact extent of the lesion present in patients so recently subjected to a serious operation some difficulties which are often difficult to overcome; yet this examination is of such value as a means of forming a prognosis that it should be undertaken at the earliest possible moment.

As a rule, the prognosis is favorable. Where treatment upon the lines indicated above is begun at an early date and systematically followed out, a complete cure will usually result, though months may elapse before the regeneration of all the fibres is complete.

Prophylaxis is more important than therapy. If the extension of the arms above the head during laparotomies cannot entirely be avoided, the time that they are so held should be as short as possible, and their position may from time to time be changed. If vomiting occurs, or if only one arm is so extended, the head should be bent away from the side of operation and supported by a small pillow. In operations upon the axilla where an extension of the arm is necessary, there should always be a thin pillow between the arm and the edge of the table, and the forearm should be supported by an assistant or allowed to rest upon a table slightly higher than the operating table itself. The arm should never be allowed to hang down over the edge of the table during any operation, as is often permitted during operations where the anæsthetist is careless. When the Esmarch bandage is used great care should be exercised to avoid making its final application at a situation where nerve-trunks will be compressed against underlying bone. An exact knowledge of the mechanism of these lesions should be more generally known, and especially required in the person who administers the anæsthetic, for the careful attention to these niceties of position will fall within his particular domain. If these safeguards are not neglected, cases of narcosis paralysis will soon cease to be reported.

H. P. De Forest.

INDEX TO SURGICAL PROGRESS.

HEAD AND NECK.

The Surgical Treatment of Focal Epilepsy. By B. Sachs, M.D., and A. G. Gerster, M.D. (New York). This paper presents a critical analysis of nineteen cases operated upon by the authors. Of these three are reported as cured, five as improved, and eleven as unimproved. Of this last group three died as the result of the operation. The authors concede that surgical procedures will avail but little in the majority of cases. In all of the cases in which no improvement resulted, the operation was not undertaken until many years had passed after the initial trauma, and after the beginning of the epilepsy. They conclude that if a long period of time has elapsed, all operative procedures will prove equally unavailing. As a result of their study of these cases, the paper closes with the following conclusions:

(1) Surgical interference is advisable in those cases of partial epilepsy in which not more than one or, at the utmost, two years have elapsed since the traumatic injury or the beginning of the disease which has given rise to the convulsive seizures.

(2) In cases of depression or other injury of the skull surgical interference is warranted, even though a number of years have elapsed; but the prospect of recovery is brighter the shorter the period of time since the injury.

(3) Simple trephining may prove sufficient in a number of cases, and particularly in those in which there is an injury to the skull or in which a cystic condition is the main cause of the epilepsy.

(4) Excision of cortical tissue is advisable if the epilepsy has lasted but a short time, and if the symptoms point to a strictly circumscribed focus of disease.

(5) Since such cortical lesions are often of a microscopical character, excision should be practised even if the tissue appears to be perfectly normal at the time of operation; but the greatest caution should be exercised in order to make sure that the proper area is removed.

(6) Surgical interference for the cure of epilepsy associated with infantile cerebral palsies may be attempted, particularly if too long an interval has not elapsed since the beginning of the palsy.

(7) In cases of epilepsy of long standing, in which there is in all probability a wide-spread degeneration of the association-fibres, every surgical procedure is useless.—*American Journal of the Medical Sciences*, October, 1896.

CHEST AND ABDOMEN.

I. Breast Excision for Malignant Disease. By HERBERT SNOW, M.D. (London). From an experience of 300 cases of breast excision for malignant disease, during a period of twenty years, the author concludes that infection of the bone-marrow is the great obstacle to radical cure by operation in mammary carcinoma. This takes place in all ordinary cases, within six months of inception, frequently earlier; its symptoms do not appear until within the second year; they may not be accompanied by nodular deposit or other palpable evidence of cancer for five to six years more. In the class of cases known as "atrophic," the condition may be delayed for several years.

Hence, these latter excepted, apparent immunity from "recurrence" for three years is a wholly inadequate basis on which to pronounce the disease radically extirpated, unless insidious marrow symptoms are also excluded by careful examination, and unless there is good reason to believe that excision has been performed before the marrow has become implicated. The most important practical point in excision of the female breast is a wide dissection of the subcutaneous connective tissue around the diseased organ, from sternum to axilla, from the subclavian fossa to the cartilage of the seventh rib.

This tissue is the really dangerous tract to be feared as nidus for recurrence, not prolongations of the mammary parenchyma. But it can always be adequately extirpated by dissecting off a flap of healthy skin, and so bringing the edges to immediate union without undue tension.

No advantage whatever is gained by the destruction of an extensive skin tract. In every single instance seen by the author the utmost benefit that surgery could confer was perfectly compatible with the union of the greater part of the wound by first intention. Should the skin be infiltrated, no amount of ablation will avail to prevent reappearance, previously insured by the marrow condition. If we encounter instances of scirrhus, or even of encephaloid (acute) carcinoma, of but two to three months' duration, no pains should be spared to eradicate permanently the disease by dissecting out the entire mamma, a wide area of subcutaneous tissue around, and the contents of the axilla ; and at least one and a half hours should be devoted to that purpose. On the other hand, in advanced cases of long-standing, it is futile to risk life by prolonged and heroic measures, when we know there is a deep-seated nidus which we cannot touch. The utmost advantage we can attain is removal of the gross lesions without risk ; prompt union of the wound ; and then by after-treatment with opium and cocaine, to procure a state in which the disease remains stationary for years or advances with almost imperceptible slowness.—*British Medical Journal,* October 17, 1896.

II. Plastic Substitution of the Mammary Gland by a Lipoma. By Professor Czerny (Heidelberg). A woman with interstitial mastitis, with adeno-fibromatous formation submitted to amputation of the left breast. She had largely-developed breasts, and possessed also a lipoma, somewhat larger than a fist, situated in the right lumbar region. In order to remedy the asymmetry consequent upon the removal of the breast, she desired to have the lipoma transplanted in its place. Two finger-breadths below the nipple the skin was divided by an incision with its convexity downward. The overlying skin was thus preserved and the whole gland removed through this curved incision. After thoroughly checking the hæmorrhage, the lipoma was rapidly enucleated and transplanted into the place of the breast under strict aseptic precautions, and the skin sutured with the exception of places for small drainage openings. At the end of eight days the skin-wound had entirely healed. There was no inflammatory reaction. The wound remained rather sensitive for six months. After the lapse of a year's time the tumor had neither enlarged nor contracted, and formed a very shapely breast.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXIV Kongress, 1895.

III. Surgery of the Non-Carcinomatous Diseases of the Stomach. By Dr. Doyen (Reims). Doyen has come to the conclusion that the painful symptoms in dyspepsia, hyperacidity and ulcus rotundum are due to reflex spasm of the pylorus. He assumes that the cicatrization of gastric ulcers is hindered mostly because of the spastic contraction of the pylorus, which keeps the edges of the ulcer constantly irritated.

For this reason, Doyen performed the operation of gastro-enterostomy in a case of gastric ulcer, with the result that the pain and vomiting at once ceased; and at the end of three years the patient still remains well. Doyen has entirely abandoned pyloroplasty. He has performed gastro-enterostomy forty-eight times with a total mortality of 30 per cent. Sixteen cases were for carcinoma; eleven for cicatricial stenosis of the pylorus and duodenum; and twenty-one cases were for spasm of the pylorus due to gastric ulcer and hyperacidity. All of these latter cases recovered completely. In one case the function of the stomach was not well performed after the operation, though the pain was entirely cured and the patient gained in weight.

For the removal of neoplasms, the author prefers the operation of Billroth. Out of eleven operations were four deaths. Two of these were operated upon when *in extremis*. A third had empyema of the gall-bladder with consecutive stenosis of the duodenum, and perished from sepsis.

In closing, Doyen reported an operation for hour-glass contraction of the stomach with torsion of the two halves upon one another, consisting in gastro-enterostomy in the upper segment.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXIV Kongress, 1895.

IV. The Treatment of Peritonitis due to Perforating Gastric Ulcer. By K. SCHUCHARDT (Stettin). The author reports two cases operated upon within the space of fourteen days; and in one of these cases, notwithstanding that there was a pretty far-reaching suppurative peritonitis, the patient recovered.

In both cases the patients were young women, who gave no previous history of gastric ulcer, so that operation was done only upon the ground of the diagnosis of peritonitis of the upper part of the abdomen.

I.—M. H., aged twenty-one years; serving maid; always healthy. Fourteen days before she had suddenly experienced an attack of great weakness. Seven days later she had again had an attack of sudden abdominal pain, prostration, and fever, followed by mental lassitude, herpes labialis, high fever, constipation, slight nausea, moderate tympanites, and abdominal tenderness. After the administration of opium the tenderness subsided, and remained only in the upper part of the abdomen. A flat protrusion of the epigastrium developed. This was punctured, and clear fluid evacuated. Laparotomy was done through a small incision. An exudate from in front of the liver was removed. The liver was found much enlarged. On incising the liver an abscess was found. Two days later the incision was enlarged. A sour-smelling exudate was found in the space between the liver and the stomach, and the upper part of the abdomen contained pus. A perforation the size of a pea was found in the anterior wall of the stomach near the lesser curvature. This was sutured, the abdominal cavity cleansed, and gauze drains introduced. Death occurred at the end of eighteen hours. The autopsy showed a circular ulcer six centimetres from the cardia.

There was a large collection of pus between the spleen and the stomach and in the left concavity of the diaphragm.

II.—W. G., aged sixteen years; serving maid; previously healthy. She was suddenly seized with severe pain in the abdomen, constipation, fever, but no vomiting, The abdomen was symmetrically dilated, very tender to pressure. Liver dulness was normal. Opium was administered. Four days later the abdomen was softer. Laparotomy was performed. In the upper part of the abdomen was found air and feculent pus. On account of the feculent character of the pus the stomach was not supposed to be the place of origin of the infection, and the large and small intestines were examined with the hope of finding in them the cause of the peritonitis. This necessitated extending the incision downward below the umbilicus. When no lesion was found in the intestine the stomach was examined, and a perforation found in its anterior wall. This was closed with twenty fine silk sutures. The spaces between the stomach and liver and beneath the diaphragm were cleansed with dry sponges. Masses of fibrin as thick as one's finger were removed from between the liver and diaphragm. Counter-openings were made on the right and left sides, and gauze drains passed into the peritoneal spaces. Fever continued for some time, but gradually subsided. At the end of two months, no complications having developed, she was discharged entirely well.

From these cases the author concludes that the history may be of comparatively little value in arriving at a diagnosis. The symptoms of perforation may easily be the first symptoms of a marked ulcerative disease of the stomach. Often the first thing is a sudden pain in the abdomen, followed by symptoms of peritonitis of the upper part of the belly. The peritonitis remains for a long time isolated between the diaphragm and the transverse colon. Usually the odor of the exudate is sour, though it is possible for it to be feculent. The preferable incision is from the sternum to the navel, and an incision at right angle to this as far as the border of the ribs on the left side. When the hole in the stomach is found it is at once sutured. An excision of the ulcer is not to be advised, as it complicates the operation very much. The products of the peritonitis should be removed as much as possible with dry sponges. The space between the stomach and liver should be drained with gauze. The concavities of the diaphragm on both sides should be treated in the same way.

Nourishment can be given by the stomach at once. Thin, salted meat broth and wine in small doses may be allowed.—*Verhandlungen der deutschen Gesellschaft für Chirurgie,* XXIV Kongress, 1895.

V. The Isolation of Non-Operable Carcinomata of the Pylorus. By BARON VON EISELSBERG (Utrecht). The author reports twenty-five cases operated upon by himself in Vienna and Utrecht by gastro-enterostomy with six deaths. The indication for these operations was inoperable tumor of the pylorus,—carcinoma in most cases. In the cases in which the stomach was not too much infiltrated, so that it could be easily rotated, he preferred the operation of von Hacker or the von Brahman-Brenner method, for the more difficult cases the method of Wölfler recommends itself.

The operation of gastro-enterostomy always relieves the symptoms of stenosis. Much less of the gastric contents comes in contact with the tumor, and it is thus spared this source of irritation. In two of his cases the pain persisted after the operation; and he explained it in that way.

For this reason von Eiselsberg has practised shutting off the pylorus from its stomach connection, as Salzer recommended doing with the intestine. Of course, this isolation cannot be complete, because provision must be made for the bile which empties into the duodenum from the gall-bladder. The operation of Billroth and later that of Kocher showed the way, by resection of the stomach combined with gastro-enterostomy, how this isolation of the pylorus might be accomplished. It consists in a division of the stomach on the proximal side of an inoperable pylorus tumor, blind suturing of the cut edges of the stomach, and then the making of a gastro-enterostomy.

This operation he performed in July, 1894, on two men of fifty-six and sixty-two years of age. Both were successful cases. In the course of three months one had gained in weight eight kilograms, and the other forty kilograms. Both of them had previously suffered from lancinating gastric pains until the tumor had been discovered and operated upon. The operation relieved the pain in both cases.

In one case the healing was entirely without reaction; in the other case a tedious suppuration occurred.

That this operation can bring about a quietus in the development of the tumor is demonstrated in a case of jejunostomy, which, in many respects, is very interesting. In a sixty-year-old woman a carcinoma was present both in the cardia and the pylorus; and for this reason a jejunostomy was done after the method of Witzel. The fistula worked very well, the pain disappeared, and as the patient had gained eight kilograms at the end of four months, she was fed by the mouth, and it was found that she could swallow well and retain the ingesta.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXIV Kongress, 1895.

VI. Cases of Extirpation of the Ileo-Cæcal Loop.

By W. Körte (Berlin).

Case I.—*Carcinoma of Cæcum with Invagination.*—A forty-five-year-old man with a movable tumor in the right side of the abdomen. Intercurrent invagination into the colon transversum underwent spontaneous reduction. Extirpation of the tumor which was situated in the abnormally movable cæcum. Intestinal suture; recovery. Increase of forty pounds in weight within the first three months after the operation.

The tumor, which was an adeno-carcinoma, was situated just behind the valvula ileo cæcalis. The lower part of the ileum was invaginated into the cæcum for a distance of seven centimetres.

Case II.—*Tuberculous Tumor of the Ileo-Cæcal Region.*—Extirpation from a twenty-four-year-old woman after a preliminary entero-anastomosis. Recovery after intestinal resection and suture.—*Ver-*

handlungen der deutschen Gesellschaft für Chirurgie, XXIV Kongress, 1895.

James P. Warbasse (Brooklyn).

FEMALE GENITO-URINARY ORGANS.

I. A New Method for Ligating the Uterine Artery after Laparotomy. By Professors Altuchoff and W. Sengiroff (Moscow).

Dr. Altuchoff, professor of anatomy in the Royal University of Moscow, has devised the following operation for ligation of the uterine artery after laparotomy.

The round ligament is seized by a hook and drawn forward towards the abdominal wall, and at the same time the Fallopian tube is pushed backward, thus making the broad ligament wedge-shaped, with the base looking upward. This procedure draws the uterine artery upward towards the round ligament and near the anterior layer of the broad ligament, while the ureter and uterine vein remain deeper down in the broad ligament and near the posterior side of the ligament. An incision three centimetres long is made parallel with and posterior to the round ligament, beginning about one centimetre from the uterus and extending outward. By working down through the loose cellular tissue, about twelve to sixteen millimetres, keeping near the anterior layer of the broad ligament, the uterine artery is easily found and may be ligated. There is no danger of including the ureter, as that is some distance deeper in the broad ligament.

Dr. Sengiroff, professor of gynæcology in the same university, has performed the operation by Altuchoff's method eight times, once to cause atrophy of the uterus, and seven times as a preliminary to removal of the uterus. In uncomplicated cases the operation is performed very easily, while in some cases of large tumors the difficulties are considerable, and require skill and experience to overcome them.—*Monatschrift für Geburtshülfe und Gynäkologie*, Bd. III, Heft 6, p. 453.

II. Vaginal Stricture for Prolapse of the Uterus. By Dr. S. Flatau (Nuremberg). In 1893 an operation was devised by Freund for holding up a completely prolapsed uterus, by passing a series of silver wire sutures under the mucous membrane of the vagina, extending from the cervix to the remains of the hymen. The sutures encircled the vagina and were drawn up so that they nearly obliterated the lumen.

Freund's paper was a preliminary report, but, as no other reports have followed, it is supposed that the operation has been given up.

Cases have been reported by Schramm, Jacobs, Mundé, and others. Baumm von Gaertig seems to have been the only one who has followed his cases after the operation. Among seven cases two were cured, one lost sight of, and in four the sutures sloughed out, and there was a recurrence in less than a year. The causes of failure of this operation, the author thinks, are threefold:

(1) The sutures are apt to be drawn too tightly.

(2) They are liable to become infected through the needle-holes in the vagina.

(3) The method of passing the suture is faulty.

To overcome these difficulties, he performs the operation as follows: The site of operation is thoroughly cleansed, and the vagina is made as anæsthetic as possible by a 20 per cent. solution of cocaine. General anæsthesia is not required. At the points of entrance and exit of the needle, a little flap of mucous membrane is cut up. The needle, which should be a large curved one not in a needle-holder, should be inserted under the flap and pushed a third of the distance around the vagina, when it may emerge from under a similar flap, and in this way made to completely encircle the vagina. It should be drawn up until the vagina will about admit a thumb, then the ends twisted and cut short. The flaps are next fastened in their original place by a fine catgut suture. Three or four similar sutures are put in. Of course, the operation is indicated only in old women who are no longer capable of coitus.

Three cases which have been operated by this method show no reaction after several weeks,

Freund suggests that this operation be called vaginal stricture, as it is preferable to the hybrid "colpostricture," suggested by Jacobs.—*Monatschrift für Geburtshülfe und Gynäkologie*, Bd. IV, Heft 2, p. 128.

III. Retrofixation of the Cervix versus Ventro-Vesico- or Vaginal Fixation of the Corpus Uteri. By DR. G. PAGENSTECHER (San Luis de Potosi, Mexico). The constantly increasing number of difficult labors from one or the other of the popular methods of treating retrodeviations of the uterus by fixing the fundus, have led surgeons to look for some method which will relieve the difficulty, but leave the fundus free both to make its physiological excursions with the filling and emptying of the bladder and to rise out of the pelvis should pregnancy occur.

Frommel, Sänger, Stratz, and others have attempted to do this by shortening the utero-sacral ligaments, or in some other way to draw the cervix back towards the sacrum and higher up in the pelvis. In order to be successful, the Douglas pouch ought to be entirely obliterated and the cervix drawn up so that it lies but little below the transverse axis of the uterus, causing the uterus to lie in a nearly horizontal anteversion.

The author has devised an operation which fulfils these requirements. The steps in the operation are as follows:

After rendering the vagina and surrounding parts as aseptic as possible by repeated cleansing, and an antiseptic vaginal tampon left in place for twenty-four hours, a Fritsch speculum is inserted and the cervix drawn down by vulsellum forceps. Two lateral points high up in the posterior fornix are seized by tenaculum forceps, while a five to six centimetre incision is made in the median line of the posterior vaginal wall beginning above at the cervix. The index-finger is worked into the wound until the peritoneum can be exposed and incised.

The cervix is then pushed back and the uterus forced forward into anteflexion. The incised wall of the vagina is then sutured to the anterior wall of the rectum in the following manner:

The index-finger is passed into the rectum as far as possible, and its anterior wall forced into the vaginal incision. A silkworm-gut suture is then passed through the lowest point of the vaginal incision, across Douglas's pouch, through the anterior rectal wall, as high up as possible and out in a reverse direction. Five similar sutures are passed and tied as soon as put in place, care being taken that each suture extends a little higher up on the rectum than the preceding, which can easily be done by pulling the structures down by the last suture passed. A small strip of gauze is passed through the upper angle of the wound for drainage, and the vagina packed with iodoform gauze. The sutures may be left in place six weeks.

One case has been operated upon by this method. There were no unpleasant complications from the operation. The patient left the bed at the end of eight days, and a week later, when examined, the uterus was in good anteflexion, the cicatrix was not sensitive, there was no thickening in the utero-sacral ligaments, and no trouble from the rectum.

Pagenstecher thinks it would be an improvement if the vaginal incision was made semicircularly about the cervix instead of vertically.

This operation is similar in principle to one practised by Pryor, of New York, who makes an incision into the peritoneal cavity back of the cervix, and packs Douglas's pouch with gauze, in order to make an aseptic cicatrix which will obliterate Douglas's pouch, and draw the cervix upward and backward.—*Monatschrift für Geburtshülfe und Gynäkologie*, Bd. IV, Heft 2, p. 115.

George R. White (New York City).

REVIEWS OF BOOKS.

A Treatise on Surgery by American Authors. Edited by Roswell Park, A.M., M.D. Volume I, General Surgery; Volume II, Special or Regional Surgery. 8vo, pp. 1600; with 786 engravings and 37 full-page plates. Philadelphia and New York: Lea Brothers & Co., 1896.

The appearance in rapid succession of these two volumes enables us to examine the completed work as a whole. It is a welcome and valuable addition to the surgical literature of the day, demonstrating anew the attainments and industry of American surgeons. The Annals of Surgery has had occasion within the year to review two other elaborate presentations of surgery by American authors,—viz., the "Text-Book," edited by Keen and White, and the "System," edited by Dennis and Billings. The bulky single volume of the one and the four large volumes of the other present two extremes of book-making between which in a middle ground these two volumes, edited by Park, appear. Each of these publications possesses special excellences, and it is not probable that any surgeon would be satisfied to be deprived of any one of them. The number and the geographical distribution of residence of the authors who have contributed to these recent publications are worthy of a passing notice. The "American Text-Book" is the work of thirteen different contributors, more than half of whom reside in Philadelphia, New York, and Brooklyn. Dr. Dennis associated with himself in the creation of his elaborate "System" forty-eight writers. Nearly half of these are from New York and Brooklyn, seven are from Philadelphia, and the remainder represent widely separated cities, reaching from Portland, Me., to New Orleans. Dr. Park has twenty-seven collaborators, only one of whom, the author of the chapter upon anæsthetics, is from Philadelphia. Boston furnishes five authors, and New York City six, while the remaining fifteen are to be credited to ten different cities, chiefly from the Middle West and South. Some duplication of authors is hardly avoidable in the production nearly simultaneously of such works, so we find that all the authors who contributed to the "American Text-Book," also contribute to the "System" of Dennis, with the exception of the writers of the chapters on the diseases of the eye and of the ear. Nine authors who contributed to the "System" of Dennis also have collaborated with Park, and three authors furnish chapters to each of the three books. Some duplication of material is equally unavoidable when the same writer treats of the same subject in different publications. Thus, examination shows that the surgery of the chest, of the head, of the stomach and intestines, of the lymphatics, of the skin, and of the larynx and trachea are discussed by the same authors in the "System," edited by Dennis, and the "Treatise," edited by Park. Any difficulties which might arise as to copyright infringements are happily avoided by the fact that both works are issued from the same publishing house. The amount of this duplication is so small, however, compared to the general bulk of the matter presented in these volumes, that it cannot be considered as detracting materially from the special value of each of them. The "System" of Dennis is an elaborate treatise, a book of reference for the practitioner; the other two works named are more in the nature of outlines or briefs, noticeable often for what they omit as much as for what they include, more full in the presentation of principles and general considerations than in the description of special conditions, especially valuable as text-books for study. The high literary and scientific grade, which all the chapters almost equally display in all these works, is a marked illustration of the wide diffusion of knowledge, of skill, and of experience which is so distinguishing a characteristic of the present period. The most noticeable feature of the treatise, edited by Park, is the degree in which it bears the impress of the editor's own personality. Nearly one-half of the material contained in the first volume is from Dr. Park's pen, including the whole of the parts devoted to surgical pathology and general surgical diseases, excepting the brief chapters on syphilis and gonorrhœa; in the part devoted to surgical affections of the tissues, the chapters on tumors, and on surgical diseases of the osseous system are also by him. The chapter on surgical diseases and injuries of the head, in the second volume, is also the work of Dr. Park. These parts of the book are marked by broad and philosophic thought; the teachings are clear and often put in a didactic style that suggests that they have been worked out in the lecture-room. The principles that underlie disease conditions is a favorite theme for him to enlarge upon. He insists that the imaginary boundaries that are supposed to separate surgery from internal medicine should be disregarded, and is at his happiest when he has to do with a theme like the surgical pathology of the blood, or the surgical aspects and sequelæ of many so-called internal diseases. The following paragraph, in which he sums up the conditions which constitute inflammation and limits the use of the term to the results of the activity of living organisms introduced from without, is an excellent example of his style, barring the grammatical fault, evidently due to the length of the sentence, while it illustrates the advanced ground which is taken not only in his own special chapters, but which is occupied throughout the whole treatise. He says, Vol. I, p. 59,—

"The factors which provoke the greatest activity on the part of intra- and extravascular cells, and which determine the richness in albumen of fluid exudates, or their prompt coagulation so soon as blood serum has escaped from the vessels, and which particularly determine the furious rush of phagocytes and that kind of intercellular conflict which leads many of the contestants on both sides to death, is produced (*sic*) solely by living organisms introduced from without, whose presence at the point of inflammation is abnormal and injurious, which are offending substances in every respect, while the whole phenomenon of inflammation is an expression of an effort to rid the system thereof. Taking this view of the subject, there is a most important distinction between hyperæmia and its consequences, which is absolutely a non-infectious condition, and inflammation and its consequences, which is always an infection and is always followed by more or less death of cells, the same being often extruded in a semifluid mass known as pus."

It will not be of any special value to go into an examination in detail of the particular chapters of this treatise. Their general character has already been stated in the preceding remarks. It is evident that in each a capable observer has striven to compress within the limits set for him as full a presentation of the subject as his space would permit. These limits have necessarily been narrow: thus to the whole subject of fractures, general and special, but fifty pages are devoted; the surgery of the gall-bladder and gall-ducts occupies four and a half pages; the appendix vermiformis is disposed of in eight pages; cancer of the rectum receives no systematic treatment, its existence being merely hinted at, in connection with stricture and ulceration of the rectum, as an indication for extirpation of the rectum, the operative technique of which procedure is more fully described. Cystitis receives a brief but clear exposition, but endometritis, that prolific source of female woes and pelvic pathology, is not mentioned, except incidentally as a complication of salpingitis. Cæsarean section and symphyseotomy are also omitted from mention.

What to elaborate and what to omit must be a question of judgment where space is limited. As a whole, this discretion has been exercised wisely, and these volumes may confidently be consulted as presenting in a concise manner the more important facts of surgical knowledge and method which have become established up to the date of their publication. LEWIS S. PILCHER.

MANUAL OF MIDWIFERY, FOR THE USE OF STUDENTS AND PRACTITIONERS. By W. E. FOTHERGILL, M.A., C.M., University of Edinburgh. 8vo, pp. 484, illustrated. New York: The Macmillan Company, 1896,

During the past year several new works on the subject of obstetrics have made their appearance, one of them encyclopædic in character, and it would seem as if the supply now exceeded the demand. Notwithstanding these facts, another work has just been published. Although this is written by an Edinburgh man, avowedly for Edinburgh men, there are some portions of the book which merit a wider circle of readers.

The opening chapters deal with pelvic anatomy, the development of the child, and the complications of pregnancy. As our knowledge of human embryology is based chiefly upon comparative anatomy, new facts are continually being reported, and new theories advanced. The recent theories of ovulation, menstruation, and conception are presented by the author in a manner somewhat at variance from those of former writers. The development of the ovum, too, has received much study, and a large folded plate, in which the progressive development of the fœtus and its membranes is shown by lines of different colors, illustrates the views of the present writer.

The chapter on ectopic gestation is of value; the classification is logical; each variety is clearly described, and appropriate treatment is indicated.

"During the last twenty years new light has been thrown on the subject of labor by the study of sections of the frozen bodies of women, who have died during pregnancy, labor, and the puerperium, and by the examination of uteri removed by Porro's operation. In the books of the future the results of sectional anatomy will doubtless be incorporated with, and will partly replace, the classical description of labor." The chapter from which the above quotation is taken is devoted to sectional anatomy. It is illustrated by full-page figures of such cases as have been recorded, and is the most valuable in the book.

The importance of an accurate measurement of the passages and the passengers is emphasized. In the description of the mechanism of labor, a subject concerning which much has been written and but little really proved, the views of Hart are adopted, and they certainly have much to recommend them.

In the record of facts established by laboratory experiments or by clinical experience, and in presenting the theories to which these facts have given rise, Dr. Fothergill appears to the best advantage. When, however, he deals with practical obstetrics, and with the surgical procedures connected therewith, he fails to maintain the good impression he has made.

The management of labor is treated from the English point of view. All illustrations represent the patient in the left lateral position. This position may have its advantages; it certainly has its advocates, but the disadvantages appear too numerous to lead to its adoption in America and on the Continent.

As a rule, the directions given are good so far as they go. Some are really amusing: if a pinch of snuff "will expel the placenta from the vagina in a perfectly physiological manner" it is well worth trying.

Other directions, if used as a guide, will certainly be followed by bad results. A catheter should *not* be passed by the sense of touch alone, even if a nurse has previously cleansed the parts.

"No attention should be paid to the pulse. The circulation may be watched as a matter of interest, but not as a guide to the administration of chloroform." That this is a dangerous doctrine, especially for students and junior practitioners, cannot be doubted.

It is not improbable that the birth of a child always causes a laceration of the fourchette if Dr. Fothergill's directions are followed, but when other methods are employed even this slight injury is by no means inevitable. Tears of the perineum must be common in the author's practice, for "only those which extend to within three-quarters inch of the anus should be stitched."

The description of obstetric operations, really surgical in character, are still more unsatisfactory. Much time and space are devoted to the theory of forceps and the proper lines of traction, but the actual use of the instrument is badly described, no mention is made of the cephalic method of application, and the blades are not to be removed until the head is completely born. The details of symphyseotomy, version, craniotomy, and other operations are so meagre as to render these sections of little value. In fact, as the latter half of the volume is read, the impression deepens that the author's amunition was exhausted in the first half of the work, and that at the last he has been obliged to use blank cartridges.

H. P. de Forest.

The Practice of Medicine. By Horatio C. Wood, M.D., and Reginald H. Fitz, M.D. Pp. 1088. Philadelphia: J. B. Lippincott Co., 1897.

Several works on the practice of medicine, either in single volumes or in many-volumed systems, are now published, or are being issued from time to time. Of the larger and more pretentious systems, the "Twentieth Century Practice" and "Clifford Allbutt's System" are for the most part inchoate. The noteworthy single volumes are two in number, one by Tyson and the other the treatise under review. Far from deprecating the abundant supply of literature in this large moiety of medical work, there is a distinct advantage in having the old material recast from different points of view, as well as knowing that the recent books contain matter hitherto found only in periodical writing. Therefore let us take courage and be thankful even if our book-shelves groan.

The preface announces that "the volume is the outcome of an attempt to view the practice of medicine simultaneously from the pathologic and therapeutic points of view." As all treatises on the practice of medicine attempt a precisely similar task, it might be better to cast modesty to the winds and state that the volume was written by two men, each of high reputation, one as a pathologist, the other as a therapeutist. But as we all know the facts, it is, perhaps, better to let them be read between the lines.

One striking feature of the book is the almost entire absence of illustrations, and in view of the abundance of cuts which are contained in various recent manuals of medical diagnosis, urinalysis, and microscopical examinations, the omission is probably justified. Another notable and, one must confess, agreeable change from previous works, is the wellnigh total disuse of foot-notes and references. We do not find the reason for so doing explicitly stated, but if any one will take the trouble to compare a half-dozen recent works on a given subject it will be found that the large majority of the references are simply copied from one to another, excepting those of current publications. In view of the existence of the index catalogue, the index medicus, and the several year-books which regularly appear, it is certainly justifiable to dispense with the thickly-scattered references which so often hinder the smooth flow of thought and give a succession of mental jolts to the interested reader. What the student is led to expect and finds in this book is a series of well-written, complete, and modern digests of attainable clinical and pathological knowledge in regard to the diseases and conditions commonly classed under the head of internal medicine.

Among some of the more interesting statements in connection with special diseases we note that recovery in advanced typical Addison's disease has followed the hypodermic use (ten to fifteen minims daily) of the glycerin extract of the suprarenal capsules of beeves. Ammonium salicylate is preferred to the sodium salt in acute articular rheumatism. The uncertain pathogeny of gout and the gouty state is acknowledged, without partisanship to any of the theories extant. "Lithæmia" is regarded as purely a term of convenience applied to the association of "lithæmic" symptoms with frequent or persistent lithuria, as distinguished from the same symptoms associated with oxaluria or phosphaturia, or without any urinary sediment.

It is to be regretted that "recrudescence" following typhoid fever is not strictly limited to a return of fever caused by dietetic or other indiscretions, and "relapse" to a repetition of the cycle of typhoid symptoms. The relatively slow pulse-rate of typhoid fever is not sufficiently emphasized, and the statement that diarrhœa is almost universal, and constipation rare, is not true in the cases occurring in Brooklyn and New York. The serum-test of typhoid is too recent to be noted. The cold-bath treatment of typhoid fever is considered of such importance that the authors insist that in private practice every obstacle to its use should be surmounted. Wood, Fitz very properly not concurring, renews his advocacy of the routine employment of oil of turpentine in the same disease. The use of antitoxine in diphtheria receives an unqualified recommendation.

The section on acute and chronic poisoning is authoritative and useful. The major portion of the few cuts in the book, mainly diagrammatic, are in connection with the section on diseases of the nervous system, and, while excellent in conception, are so small and poorly made as to be useless, notably the important diagram from van Gehuchten, on page 482.

There is some difference of opinion between the authors as to the treatment of appendicitis. It is difficult without quoting at undue length fully to indicate these divergences, but Wood apparently favors earlier and more frequent operation than Fitz, the latter believing that the large majority of cases can recover safely and quickly under medical treatment.

There is a further divergence of opinion as to the use of leeches, calomel, and salines in acute peritonitis, Fitz considering leeches harmful, and carefully avoiding laxatives, unless he is able to exclude positively the alimentary source of the peritoneal symptoms,—*e.g.*, perforation or strangulation,—preferring to use enemata and only sufficient opium to relieve pain. Wood uses opium to decided and continuous narcotism, and seems to have more confidence in his ability to determine the propriety of employing salines.

There are many other points of interest in the volume for which the original should be consulted. Twenty-eight tried formulæ and twelve temperature charts are appended. The index is only reasonably full.

A rather careful perusal of this book has convinced the reviewer that it is trustworthy, well-balanced, judicious, and modern. It is not padded, it is complete, and is worthy of a good place in the library of the medical clinician.

GLENTWORTH REEVE BUTLER.

CORRESPONDENCE.

AN IMPROVEMENT OF THE TECHNIQUE OF END-TO-END INTESTINAL ANASTOMOSIS.

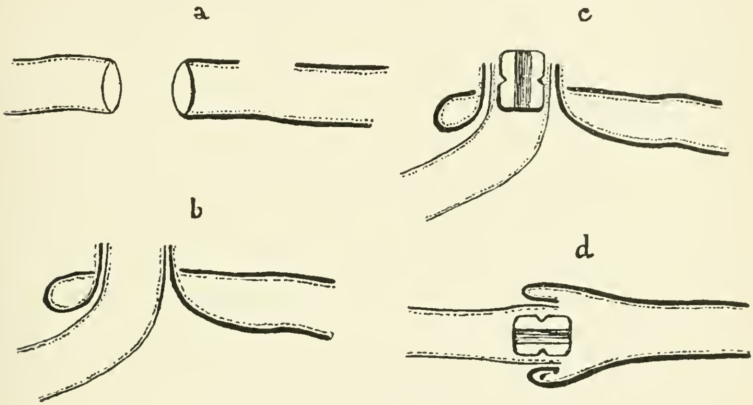
In the *Centralblatt für Chirurgie* of December 19, 1896, Ullman reported, from his clinic at the Sisters of Mercy Hospital, in Vienna, two cases of intestinal anastomosis by a new modification of an old method. Having been his first assistant at these and former operations of a similar nature, he has very kindly allowed me to report them to the ANNALS OF SURGERY.

He had previously carried out the operation as directed by Mannsell, but in his last two cases modified the method so that, although resting on the same principles, the operative technique is improved, the time necessary diminished, and the operation simplified.

The steps of the operation are as follows:

A longitudinal incision, five to six centimetres long, is made in the proximal end of the intestine opposite the insertion of the mesentery (a). The proximal end is now invaginated in its own lumen and brought out through the longitudinal incision in its wall (b, the accented line). The intestinal mucous membrane,—the dotted line,—as it protrudes from this longitudinal incision is outside, and the peritoneum inside. The distal end is now drawn through the invaginated proximal end. As the distal end is not invaginated, its peritoneum is outside and the mucous membrane inside. A glance at b will make this clear. The peritoneum of the distal end lies on the peritoneum of the proximal end, while the mucous membrane of the distal end is directed inward; that of the proximal, outward.

A piece of carrot previously prepared in the shape of a hollow cylinder, two to two and a half centimetres long and one and a half to two centimetres broad, with a groove running transversely around its middle, is now taken and both ends of the intestine are tied over it with catgut or silk (c). The ligature lies in the groove on the carrot and is in the intestinal lumen,—namely, on the mucous membrane of the proximal end. Both ends are now pulled back to their original positions and the longitudinal incision closed by interrupted or continued suture (d). The carrot now lies in the lumen of the bowel,—the same is true of the ligature. The continuity of the intestinal canal is restored by the hole pierced through the centre of the carrot.



Ullman's method of intestinal anastomosis. Accentuated line denotes the serosa of the proximal end; unaccentuated line, the serosa of the distal end; dotted line, the mucosa.

Ullman's technique is as follows: He draws the proximal end into itself by two fixation forceps introduced into the longitudinal incision, so that one forcep holds the gut at its mesenteric attachment, the other at a point directly opposite. He now draws the distal end through the invaginated proximal end by two fixation forceps catching the bowel in the same manner as before. He now removes two of the fixation forceps, making the other two hold *both* ends together at the mentioned points, and the two forceps just removed are applied at the middle points between the two already holding the walls, so that the circle representing both ends of the intestine is now divided into four quadrants.

The carrot should be fairly hard, but not fibrous. The central canal is pierced with a canula. It is not necessary to mention that turnip, potato, or decalcified bone can be employed instead of the carrot. The carrot appears to be digested on the seventh day. When the hollow cylinder has been introduced it must be firmly held by one assistant until it is tied in place. The other hand of the assistant holds the four fixation forceps.

Either catgut or silk can be employed. Experiments show that thick catgut, prepared in formalin, remains practically unchanged in the human intestinal canal for from six to seven days.

The ligature holds the carrot so firmly that even vigorous efforts fail to displace it.

The longitudinal incision should not be made too near the end of the bowel, as the carrot may obstruct its subsequent suture.

The employment of vegetable material for intestinal anastomosis dates from von Baracz, who used turnip- and potato-plates instead of the decalcified bone ones of Senn. Landerer employed hollow turnip cylinders, but he worked *from the outside.* He sutured the mucosa to the carrot, the sutures piercing the latter, and finally applied sero-serosa sutures to cover the previous ones.

Ullman carried out the above operation on dogs and twice on the living; once in a case of intestinal exclusion for anus præternaturalis and again in a case of tuberculosis of the cæcum. In both cases the recovery was uneventful.

W. Hersey Thomas, M.D.

Vienna, December 28, 1896.

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THE SURGICAL TREATMENT OF PERFORATING TYPHOID ULCER.[1]

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As early as 1762, A. G. Richter,[1] in Vienna, first suggested the advisability of opening and draining the peritoneal cavity in cases of general suppurative peritonitis. This suggestion was repeated in 1816 by Van Vrecken,[2] in Paris. Sixty years later, in 1876, F. Kaiser,[3] in Freiburg, collected fifteen cases operated upon up to that time. The majority of these were cases of localized peritonitis in women. General attention, however, was not directed towards this method of treatment until E. Leyden,[4] in 1884, in Berlin, in a paper read before the Association for Internal Medicine, recommended its use in the following words:

After speaking of the very unsatisfactory results of the medicinal treatment, he said, "I cannot longer forbear mentioning that which I have for a long time had in mind,—namely, whether or not it is possible to treat the peritonitis by operative measures. The idea is rational enough when one considers that suppurative peritonitis is very similar to suppurative pleuritis." Farther on he says, "But I must leave it with the surgeons to determine whether it is possible to accomplish anything by operation in this condition; but one thing is certain, it seems to me, that herein lies a most fruitful field for investigation."

The surgeons were not long in following out Leyden's suggestion, for later in the same year appeared an exhaustive article by Mikulicz,[5] in which he reviewed the cases operated upon up to that date, and reported three additional of his own, among which was one supposed to be a general suppurative peritonitis following a perforated typhoid ulcer in a man who had considered himself well up to the time of perforation. We shall have more to say about this case later.

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[1] Read before the Surgical Section of the Academy of Medicine, Buffalo, N. Y., January 12, 1897.

Dr. J. C. Wilson,[6] of Philadelphia, in 1886, wrote as follows: "Granted that the chance of a successful issue is heavily against you; that the patient is in the midst or at the end of a long sickness; that his tissues are in the worst state to stand the injuries of the surgeon's knife; that the lesion of the gut may be very extensive; that the vital forces are at the lowest ebb; no one yet has hesitated for these reasons to perform tracheotomy in the laryngeal complications of enteric fever, which require it to save life. The operative treatment of purulent peritonitis has been performed successfully many times by gynæcologists in conditions scarcely less promising. In point of fact, the objections which may be urged against laparotomy in intestinal perforation in enteric fever are no more forcible than those which would have been made use of at first against the same operation in gunshot wounds of the abdomen. . . . The courage to perform it will come of the knowledge that the only alternative is the patient's death." Prophetic words!

Since this time medical literature abounds in the reports of operations performed for the relief of suppurative peritonitis from whatever cause, and with an ever-increasing degree of success.

The first operation, however, undertaken in a known case of typhoid fever for the relief of symptoms caused by a suspected perforating ulcer, was performed by Lücke,[7] of Strasburg, in 1887.

The operation took place twelve hours after the onset of the symptoms of perforation. A wedge-shaped piece of intestine, including the ulcer, was excised, and the bowel sutured; this patient survived only a few hours.

In the same year Bontecou,[8] of Troy, N. Y., operated upon a case thirty-six hours after the appearance of the first symptoms of perforation. This patient also died. This, the first case operated upon in the United States, was performed without any knowledge of previous similar operations.

Since this time I have been able to collect forty-six cases reported in the literature on the subject, and add to this number six hitherto unpublished cases, including three of my own; in all fifty-two cases. Before proceeding further, it is of interest in this connection to review briefly our present knowledge relating to the conditions under which perforation of the ulcerated Peyer's patches occurs. From a compilation of statistics furnished by a number of the best authors (Murchison,[9] Schulz,[10] Liebermeister,[11] Hölscher,[12] Louis,[13] Fitz,[14] Osler[15]) perforation of the intestine occurs in from 1 to 2 per cent. of all typhoid fever cases. As a cause of death in fatal cases it is found in between 6 and 7 per cent. It occurs in the ileum, usually within the last two feet, in over 80 per cent. of all cases; in the large intestine in more than 12 per cent.; in the appendix vermiformis in about 5 per cent. of all cases. It is usually single, but may be multiple.

There seems to be no definite relation between perforation and the severity of the attack. It takes place in mild as well as severe cases; the symptoms marking its onset may be sudden and severe, or very mild, and at times even wanting entirely. It occurs more often in men than women, in about the ratio of 3 to 1. It is rarely met with in children. It is seen more frequently between the ages of twenty and thirty years, and in the third week of the disease. The duration of life following the perforation is, as a rule, short. According to Fitz, over 37 per cent. died on the first day, over 29 per cent. on the second day, and over 83 per cent. of all cases during the first week.

The perforation is always followed by a suppurative peritonitis, general or localized. If the latter, a much more favorable termination may be looked for, as many cases of resolution or spontaneous discharge of the pus through different organs or from the surface of the body have been observed.

Only since the report of Buhl's[16] classical case, in 1857, has the possibility of recovery from intestinal perforation been recognized. Since that time the number of recoveries reported as following the so-called characteristic symptoms of perforation has multiplied, so that now it is generally admitted that the accident, although always serious, need not prove fatal in every case. It is, at the same time, an admitted fact that a peritonitis which often proves fatal may develop in the course of a typhoid fever without any discoverable perforation of the intestine. It was present in 2.2 per cent. of the Munich autopsies. Many well-recognized cases of sudden peritonitis from causes other than perforation of an intestinal ulcer may arise in the course of a typhoid fever,—*e g.*, from rupture of softened mesenteric glands, abscesses of the liver, perforating ulcers of the gall-bladder, softened infarcts of the spleen, etc.

Such being the case, Fitz[14] has very aptly remarked, " Since perforation of the intestine in typhoid fever may take place without any suggestive symptoms, and since suggestive, even so-called characteristic, symptoms may occur without any perforation having taken place, it must be admitted that recovery from such symptoms is no satisfactory evidence of recovery from perforation."

The true percentage of recoveries from perforated typhoid ulcer, without operation, and of deaths, where no autopsy has been made, must, therefore, remain for the present at least unknown.

The number of operations as yet recorded for the relief of this condition is too small from which to draw any very definite conclusions, but a study of the cases in detail is most interesting and instructive.

Of thirty-five cases in which the probable time in the course of the disease is given, in twenty cases the perforation occurred in the third week; in four in the second; and in three in the fourth week respectively. The longest period was four months, and during the second relapse. In one other case the perforation occurred late, during a relapse. In several of the very mild cases it was impossible to estimate at all accurately the period of the disease. Of twenty-six cases in which the character of the fever is mentioned, ten were very mild, of the ambulatory type, twelve of moderate severity, and four only were very severe.

Of the so-called characteristic symptoms of perforation, sudden and severe abdominal pain was present in thirty-two cases;

collapse, more or less severe, in ten cases; nausea and vomiting in sixteen cases; chill in four; hiccough in four; a marked fall in temperature in only two. In five of the cases the symptoms denoting perforation were not marked and came on gradually. In five of the cases only was the absence of liver-dulness noted.

The length of time intervening between the onset of the symptoms denoting perforation and the operation, in thirty-five cases in which it was mentioned, varied between two hours, which was the shortest time, and twelve days the longest. In twenty-two of the cases the operation was performed within twenty-four hours; and in nine within twelve hours.

Marked symptoms of collapse and shock, with weak and rapid pulse, were present in twenty-seven of the cases, at the time the operation was begun. In thirty-one cases more or less marked symptoms of general peritonitis were noted. Local signs suggesting the possibility of involvement of the appendix were recorded in thirteen of the cases.

The condition of the patients at the time of the operation was, as a rule, distinctly unfavorable, as in only five cases of the series is it described as fair or favorable.

At the end of operation twenty-one cases were reported as being much collapsed, in two the operation was not completed on this account. Nine were in fair condition when they left the operating table.

In only eighteen cases was mention made of the kind of anæsthetic used. In nine of these ether was used, in eight chloroform, and in one first chloroform and then ether.

The median incision was made use of in twenty-one cases, and the right lateral in seven.

Thirty-three of the cases are reported to have had, at the operation, marked general septic peritonitis with the presence of foul pus and exudate in considerable quantity. In thirty of these cases fæcal matter was also present. In only two instances is it noted that the intestine was not greatly distended.

The seat of perforation, almost always in a thickened and inflamed Peyer's patch in the ileum, varied from two centimetres to one metre above the ileo-cæcal valve. In only two cases was there more than one perforation at the time of operation. In each of these there were two holes, and in one the appendix was the seat of one of the perforations. In twelve of the series, multiple thickened and congested Peyer's patches were observed. The mesenteric glands opposite the ulcerated patches were, as a rule, enlarged and softened. In but a single instance was the appendix alone the seat of the perforation. In none was the large intestine involved. The treatment of the much-inflamed peritoneum and the manner of closing the opening into the bowel varied within wide limits, and represent fairly well the evolution of abdominal surgery during the past decade. In twenty-nine cases irrigation of the peritoneal cavity was practised. Many different solutions were made use of by different operators for this purpose,—carbolic acid, bichloride of mercury, salicylic acid, boric acid, and normal salt solutions, and plain boiled water. In five cases the toilette of the peritoneum was completed by wiping alone,—pledgets of gauze being used for this purpose. The edges of the ulcer were excised in eight cases, before suturing. In two cases, one of which was successful, the bowel was resected, a wedge-shaped piece being removed; in another, the edges of the ulcer were stitched to the abdominal wound, and an artificial anus established.

It is only by collecting and studying the cases as they are reported from time to time in the literature, that we can ever hope to obtain enough data from which to lay down intelligent rules for future guidance. Unfortunately, many of the cases in the series have been so imperfectly reported as to be of little use for our purpose, and the statistics are necessarily incomplete.

If we include all the cases that have been reported as operations after perforating typhoid ulcer, together with the six cases I have collected, and which are now reported fully for the first time, we have in all fifty-two cases, with seventeen recoveries (32.68 per cent.), a truly remarkable showing. Excluding, however, all doubtful cases, concerning which we shall speak more particularly later, we have left forty-five cases, of which 11 recovered, a percentage of 26.22. We believe, however, for reasons to be given presently, that Mikulicz's first case, and Dandridge's also, should be admitted. This would make the final and, as we believe, the correct status of the operation up to date as follows: Forty-seven cases with thirteen recoveries, a percentage of 27.65.

Drainage was employed in twenty-eight cases by means of either gauze or tube. Seven were tightly closed after cleansing the peritoneal cavity.

In eight cases a wrong diagnosis was made. Three were supposed to be appendicitis; in two ileus had been diagnosed; in two the symptoms were thought to be those of internal obstruction, cause unknown; one remained undiagnosed at the time of operation.

The length of time consumed in the operation is given in but eight cases. It varied from forty minutes to two hours.

Autopsies were obtained in nineteen of the fatal cases.

Of thirty-six cases in which the age of the patient was mentioned, four were under twenty years; twenty-two between twenty and thirty; eleven between thirty and forty. In two instances the patients were children nine years old, an unusual occurrence. The oldest was a man fifty-five years of age.

Of forty-two cases in which the sex was given, thirty were males and twelve females.

Of thirty-nine cases more or less fully reported, six are doubtful. Let us review them briefly.

Taylor's case. In all probability the abdominal condition was in some way connected with his typhoid fever, of which he had two relapses, but in just what way does not appear. The severe attack of hæmatemesis immediately preceding the abdominal pain, and the subsequent abscess formation is suggestive of gastric ulcer. At the time of operation, however, nothing further than a localized abdominal abscess was made out. We exclude this case, therefore, for want of evidence.

Mikulicz's first case has been much discussed. Undoubtedly cases of typhoid fever of the "walking" type are occasionally observed, where the symptoms are so mild as to escape observation until perforation or hæmorrhage occurs. Mikulicz weighs the evidence for and against the diagnosis in his remarks upon the case, and it must be admitted that from the location, size, and shape of the ulcer, the enlargement of mesenteric glands, and from the subsequent history of the case, that it was more than likely an instance of typhoid perforation. We think this case, all things considered, should be admitted, and have therefore included it in our summary.

Escher's case is clearly one of appendicular abscess. It seems strange that it should ever have been reported as a case of supposed typhoid perforation. This case is excluded.

Smith's case is so incompletely reported that it is impossible to make anything definite out of it, except that it was an abdominal abscess communicating with the bowel.

Dandridge's is a most interesting case, as a reference to the abstract of it will show. The presence of typhoid fever is undoubted, the diagnosis having been made and confirmed by competent physicians before the onset of symptoms of perforation. The presence of gas in the peritoneal cavity in such amount can only be explained satisfactorily by the supposition of an intestinal perforation having existed somewhere, at some time. It may have become closed by the time of the operation. The presence of the stinking pus is also suggestive. We have therefore admitted this case, although perforation was not actually seen. If the appendix was the seat of perforation, it was in all probability of typhoid origin.

The diagnosis in Price's second case, owing to other pathological conditions existing at the time, is so uncertain that I have excluded it also. This was a case in an advanced stage of tuberculosis of the lungs, with no particular sign of enteric fever save the intestinal ulceration, which was quite as characteristic of tuberculosis of the intestine as of typhoid fever. It is unfortunate that this, as well as the other two cases of Price's interesting series, should have been so incompletely reported.

The cases of Hahn, Bartlett, Allingham, Wagner, McMurtry, and Canoli are so incompletely reported as to be of no value, except in the general summary of cases reported in the literature as perforating typhoid ulcers that have been operated upon.

The full report of Cholzow's cases has not as yet reached this country; only a brief abstract appears in the *Centralblatt für Chirurgie*.

Now what conclusions, if any, can be drawn from a study of these cases? Obviously, since the number of complete reports of cases is so small, and the prominent symptoms in these so different, and the methods employed in dealing with the conditions presenting, both during the operation and after it, so varied, it would be foolish to attempt to draw any very definite conclusions. There are, nevertheless, several points quite prominently brought out in studying the group as a whole. The age and sex bear out pretty closely their respective percentages as quoted in the beginning of this paper.

The third week is by far the most frequent time for the occurrence of perforation. The accident happened much more frequently in mild than in severe cases, which certainly is of advantage in case of operation. The most constant and characteristic sign of perforation recorded was sudden, severe abdominal pain, persisting with increasing intensity for some time. Nausea and vomiting were present in about 50 per cent. of the cases.

To what extent the element of time affected the results of the operations does not appear. For some of the cases operated upon earliest died the soonest, and *vice versa.* It would seem most reasonable, however, to suppose that the earlier the operation is performed, after the patient has recovered somewhat from the primary shock and collapse usually attending the perforation, the more favorable, *cæteris paribus*, would be the result. I think the evidence deduced from the cases will bear this out. It is more than likely that the shock of the perforation still present when the operation was begun in Mikulicz's second case, and from which the patient never recovered after the operation, had something to do with hastening death. The most striking of the cases that recovered were operated upon, as a rule, about twelve hours following perforation. Where marked symptoms of shock and collapse were present at the time of operation the prognosis was distinctly influenced for the worse. There was a striking similarity noticed in the condition of the peritoneum and viscera, intense congestion, large amount of feculent pus and exudate, together with distention of the bowel. In only two cases was it observed that the intestine was not distended. Both these cases recovered. The fact that the ileum, in the last metre of its length, was the seat of perforation in every case but one is suggestive of the place to search for the perforation first, at any rate. In only three cases did more than one perforation exist, one of which was in the appendix. This would suggest that it would be safer always to examine carefully the ileum throughout its entire length for other perforations, and, as a prophylactic, to take a suture or two over the bases of suspicious-looking patches, as was done in several instances. It will be well also to satisfy oneself as to the condition of the appendix and cæcum, and if the former seems at all abnormal to remove it. This was done in five instances in our series. Quickly done it adds nothing to the shock of the operation, and removes one fruitful source of trouble.

Not much light is thrown upon the still mooted question of the respective merits of irrigating or wiping the peritoneal cavity. Eight of ten cases in which a general peritonitis existed recovered after irrigation. In only four cases of the series was wiping of the peritoneal cavity practised, two of which recovered. Because all but two of the fatal cases were irrigated, it would be unfair to say that this influenced the fatal termination more than some other circumstances. In a case where the inflammatory process has gone beyond circumscribed bounds, and yet has not invaded the entire peritoneal surface, as was the condition in my third case, I cannot but think that there is an element of danger in the irrigating fluid being a possible agent in disseminating the infection. The irrigating fluid must, of necessity, be so bland as to be practically without any antiseptic property. The irrigating fluid *par excellence* is, of course, normal salt solution, as has been abundantly proved. The methods of dealing with the perforation as practised by some of the operators—viz., excision of the edges and resection of the portion of bowel containing the ulcer with immediate suture—are uncalled for, and needlessly prolong the operation. If the intestinal wall is in such bad condition as to render suture of the perforation unsafe or impossible, it would be better, in my judgment, to pull the perforated loop out of the abdomen and leave it there for a subsequent resection and anastomosis, after the patient had recovered from his fever. There was ample evidence in the autopsy reports that union of the opposed peritoneal surfaces took place just as satisfactorily in those cases where the edges of the ulcer had not been excised as in those in which they had been so treated. The kind of stitch used is a matter of preference. We believe that the mattress suture of Halsted possesses certain advantages over other sutures, and hence prefer it. Whether the line of sutures is parallel with the axis of the bowel or at right angles to it is immaterial, and is determined by circumstances. Whether one or more rows of sutures are to be used is also determined by circumstances and the condition of the bowel wall. Care should, however, be exercised to avoid encroaching upon the lumen of the bowel any more than is absolutely necessary.

Drainage should always be employed. True, a case now and then will recover without it. That the peritoneum is able to take care of a certain amount of infectious material has been abundantly proved, but it is best not to overtax its powers.

In a case of general septic peritonitis, the peritoneal cavity is, for the time being, an abscess cavity, and should be treated as such, first by thorough evacuation of its contents, and then by the establishment of effective drainage. This is best accomplished by means of wicks of bismuth or iodoform gauze carried into different parts of the cavity, and their ends brought out through the abdominal wound, which can be tightly sutured throughout the rest of its extent. Drainage in the most dependent portion should be practised more often than it is, as illustrated by Ferraresi's and Mikulicz's first case.

In eight cases of the series, a wrong diagnosis was made, but in every case the symptoms clearly indicated the necessity of operative interference, and the conditions found in the abdomen justified it. Appendicitis and intestinal obstruction from a variety of causes are the affections most commonly mistaken for it. That in eight, or over 15 per cent. of the cases, the wrong diagnosis was made illustrates very well the fact that the recognition of perforation of the bowel in the course of typhoid fever is not always easy. The so-called characteristic symptoms are not invariably present, and when they are, they may be so altered or obscured by other conditions that perforation may not even be suspected. The signs upon which most dependence is to be placed are sudden acute pain in the abdomen, with symptoms of collapse, accompanied by an abrupt fall in the temperature, it may be, of several degrees. Vomiting is not infrequently present. Various special symptoms have been, from time to time, made much of by writers upon this subject,—*e.g.*, the obliteration of liver dulness, the gurgling sound on respiration, hiccough, etc. These, like McBurney's point in appendicitis, are very good signs when present. It is quite apparent that there has been, as yet, no pathognomonic sign of perforation described. There is one other point, however, which promises to be of the greatest aid to diagnosis in doubtful cases, and to which, hitherto, little or no attention has been paid,—that is, the examination of the blood. According to Thayer,[17] "it has been generally recognized by almost all recent observers, as well as by some of the older ones who have investigated this special point, that there is not only no increase in the proportion of colorless corpuscles (leucocytosis) during the fever, but that, on the contrary, there is rather a tendency towards a diminution in number at the height of the disease."

In typhoid fever at the onset, the white corpuscles are about normal. During the course of the fever the number gradually sinks, reaching its lowest point usually about at the end of the febrile period, at which time they are almost invariably subnormal, varying from 2000 to 6000 per cubic millimetre.

With the development of an inflammatory complication, immediately a marked increase in the number of leucocytes is observed, which increase takes place under no other known conditions. To be sure, slight temporary leucocytosis has been observed under certain methods of treatment, and immediately following a cold bath, but this is so slight, or of such short duration, that it is not likely the one will be mistaken for the other.

Richard C. Cabot,[18] of Boston, in his work on the "Clinical

Examination of the Blood," which is just out of press, calls attention to the marked leucocytosis occurring at the time of perforation. He gives the counts of the blood in two cases. In one, the blood count showed the number of leucocytes before perforation to be 8300, and immediately afterwards 24,000. In a second case the number at the time of perforation was 18,500. The number before perforation is not stated. In one of the cases of our series (Porter's) the blood count showed 6500 whites before, and 10,600 immediately after perforation. In one of my own cases the leucocytes were 3000 before and 16,400 after perforation.

It can thus be seen, judging from the few observations made up to the present time, that the systematic examination of the blood from the beginning should be made in every case of typhoid fever, as it may be, in the event of obscure complications, of the greatest diagnostic importance. In three cases of our series a wrong diagnosis of appendicitis was made.

Fitz,[14] in his admirable paper upon this subject, has called special attention to the striking similarity of the symptoms of typhoid perforation of the bowel to those of inflammation of the vermiform appendix.

Undoubtedly many errors of diagnosis have been made in differentiating these two conditions. Dieulafoy,[19] in a recent paper recognizes two distinct forms of typhoid appendicitis as capable of producing peritonitis. To these he gives the names of "Peritonitis by Propagation" and "Para-Appendicitis."

In the former the lymphatic elements of the appendix become the seat of typhoid lesions, with ulceration, perforation, and consequent peritonitis. The symptoms of this condition do not differ from those that attend perforation in other parts of the bowel as a result of typhoid ulceration.

In the other form of appendicitis complicating typhoid fever, the condition is a true appendicitis of the usual variety, with the classic symptoms of that disorder, and the possibility of all of its complications.

As a rule, symptoms of peritonitis quickly follow perforation, and their intensity depends largely upon the nature of the infecting agent, the size of the opening, and the extent of surface involved. There is abundant evidence that pyogenic cocci are rarely absent from the intestine. "They are often present in such small numbers as to escape detection, but the great frequency with which these cocci, particularly the streptococcus pyogenes, are found in the exudate of perforative peritonitis where they can readily multiply, shows that they are common inhabitants of the intestine." (Welch.)[20]

This being the case, the kind of organism found present in the pus from a given case of perforative peritonitis is largely fortuitous.

It is interesting to note, however, in this connection, the findings in cases of peritonitis following perforating typhoid ulcers in the Johns Hopkins Hospital. The autopsy records show seven deaths from this cause. Of these bacteriological examinations of the peritoneal exudate are recorded in six cases. In four of these there was a mixed infection of the streptococcus pyogenes and bacillus coli communis, in one a pure culture of the streptococcus, and in one a pure culture of the colon bacillus.

The absence of the bacillus of Eberth and Gaffky from the peritoneal exudate in cases of peritonitis following the perforation of a typhoid ulcer is worthy of note, in view of its now generally accepted pyogenic properties. In all probability it is present at some time, in greater or less numbers, in every case, but is overgrown and destroyed by its more active and vigorous companions, the streptococcus pyogenes and bacillus coli communis. To demonstrate with certainty its presence in the exudate, plate cultures should be made immediately, in order to isolate this organism from its fellows.

Unfortunately the bacteriological examination of the peritoneal fluid is recorded in but a single instance in the series, my third case. In this, cover-slips and cultures showed pure colon bacillus. In Porter's case the typhoid bacilli were found in the liver and spleen.

The typhoid bacillus in pure culture has been found in a localized peritoneal abscess, occurring later in the course of the disease (Klein).[21]

As to the incision, of the twenty-eight cases in which the incision is noted, twenty-one were median and seven lateral. The general advantages of the median incision in abdominal surgery are obvious. In certain cases, however, especially where marked rigidity of the abdominal muscles is present, this incision does not afford easy access to the right iliac fossa. Since, as we have seen, the perforation is, in a large majority of cases, located in this region, it would seem better here as in appendicitis to make the incision immediately over the part most often affected. If, for purposes of drainage, this incision proves insufficient, a counter-opening may be made in the loin or on the left side.

The length of the incision should always be sufficient to enable the operator to examine the condition of the parts, and permit him to explore and cleanse the peritoneum thoroughly. Upon this latter procedure depends, in a large measure, the success of the operation. A long incision heals just as quickly as a short one.

The length of time consumed during the operation and anæsthesia, however small a part it may play in operations upon the trunk,[1] certainly does play an important *rôle* in deciding the ultimate result. Therefore speed and dexterity should be cultivated, but never at the expense of thoroughness.

The autopsy reports were especially interesting as throwing light upon the healing process during the fever, and also as showing the causes of death in the fatal cases. Examination of the sutured surfaces of the intestine at the different stages in which they happened to be, invariably showed the healing process well under way. In none except Lücke's case did it seem to be defective. Porter's case was especially interesting in this particular, as it is the only one in which a report of the microscopic examination of sections through the line of suture is given. The healing was typical, except for the excessive round-cell infiltration due to typhoid ulceration.

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[1] Dr. Halsted has demonstrated repeatedly in performing his operation for the removal of cancer of the breast and lymphatic glands that a patient can be kept under the influence of ether for from three to four hours without exhibiting any appreciable symptoms of shock, provided she is not suffered to lose any blood, every oozing point being stopped immediately.

Some of the complications found at autopsy were very interesting. Routier's case, for instance, was apparently progressing steadily towards recovery, when unfavorable symptoms suddenly developed, and the patient soon succumbed. Autopsy showed two other recent perforations.

Bogart's case progressed favorably up to the third day, when symptoms of intestinal obstruction developed. Was opened up again after some hours, but operation had to be abandoned on account of patient's condition. Autopsy showed intestinal suture sound, but complete obstruction of colon at hepatic flexure, produced by bands of adhesions from gall-bladder. In two cases the drainage-tube was found to be kinked, and not draining at all. In the majority of instances, however, death was due to septic absorption from the peritonitis.

It is also interesting to note the vitality exhibited by some of the cases that recovered,—*e.g.*, my third case who, subsequent to the operation, suffered two relapses, one of great severity, a suppurating otitis media, a left-sided pleurisy, a right-sided femoral phlebitis, a severe neuritis of both legs, and the painful toes so common after the cold-bath treatment.

When the inflammatory process remains sharply localized, resolution or circumscribed abscess formation may result. Spontaneous cure of the abscess may take place, as in similar conditions, by a slow process of absorption, or by rupture into the hollow viscera, or upon the surface of the body. It may, however, break into the general peritoneal cavity and cause death by peritonitis. If treated surgically in just the same way as any other abdominal abscess, by incision, evacuation of pus, and drainage, the prognosis is excellent.

In cases of fully-established general peritonitis from the perforation of a typhoid ulcer, we have a much more difficult problem with which to deal, but I believe, after a careful consideration of the histories of the appended cases, we are justified in giving our patients or their friends some such prognosis as this: "Without operation the chance of recovery is very small. Now and then a case has recovered after what appeared to be a perforation of the bowel. With operation the chances of recovery are a little better than one in four (27.65 per cent.). Why not give him the benefit of the operation?" In the treatment of a case of perforating typhoid ulcer there are three things to be done: (1) Finding and closing the perforation; (2) emptying and cleansing the peritoneal cavity; (3) the establishment and maintenance of effective drainage. For the accomplishment of these ends there are certain well-established methods familiar to all surgeons, and which it is unnecessary to review here.

The method employed in my third case, however, and which I have since made use of with success in two cases of perforated gangrenous appendicitis with beginning suppurative peritonitis, has proved most satisfactory. The steps of the operation are as follows: An oblique incision in the right iliac region, as if for appendicitis, long enough to give ample room through which to work, say six inches in length. Find the cæcum, which is always to be recognized by the longitudinal bands. This is the guide to the ileum (or appendix). Then with this as a starting-point systematically draw out the coils of ileum through the abdominal wound. Let an assistant wipe, with a gauze sponge wrung out of hot salt solution, the intestine as it is withdrawn, and another assistant keep it covered with warm salt sponges or towels. All the infected intestine should be drawn out of the peritoneal cavity, ileum, jejunum, duodenum, if necessary the whole of the small intestine. Then with large gauze abdominal pads and sponges wrung out of hot salt solution, carefully and systematically wipe out the peritoneal cavity until macroscopically clean, paying special attention to the pelvic portion. It is not usually necessary to irrigate with salt solution to do this. Next uncover the intestines and irrigate them thoroughly while outside the abdomen with hot salt solution, then begin to replace them in the inverse order from that in which they were withdrawn, being careful to wipe them dry, and free them thoroughly from flakes of lymph, fæcal matter, etc. The worst coil should be the last replaced, and the sutured portion next the abdominal wound. This should be packed about with strips of bismuth gauze, and a strip introduced into the pelvis, if necessary. By packing about the worst or sutured coil of intestine and leaving it superficially placed, you insure good drainage and provide for the escape of extravasated fæcal matter, if any such extravasation should take place. Then close the abdominal wound tightly, except a small opening for the gauze drain to come through. If there is much distention, the bowels should be moved early and thoroughly by calomel in broken doses, followed by salts, and, if necessary, a high turpentine and soap-suds enema.

If stimulation is necessary, more reliance is to be placed on hypodermics of strychnine, enemata of several ounces of hot, black coffee, and the transfusion into the cellular tissues under the breast of a quart or more of the normal salt solution, than on any other remedies.

Finally, if I were to sum up my impressions formed from a study of this series of cases, and from my own experience in the management of the conditions presented, it would be somewhat as follows:

(1) Of all the so-called diagnostic signs of perforating typhoid ulcer most reliance is to be placed upon the development of an attack of severe, continued, abdominal pain, coupled with nausea and vomiting, and at the same time a marked increase in the number of white blood-corpuscles.

(2) The surgical is the only rational treatment of perforating typhoid ulcer.

(3) There is no contraindication to the operation, surgically speaking, save a moribund condition of the patient.

Case I.—Mr. M., aged about fifty-five years, was taken sick about October 15, 1894, complaining of headache, general malaise, pains in limbs and joints, together with irritability of the bladder. Was seen on October 19 by his physician, Dr. Wesley C. Stick, of Glenville, Pa., to whom I am indebted for the notes of the case. "He gave an indefinite history of having felt badly for about ten days. He had at this time a temperature of 102° F., frequent micturition, bowels constipated, pulse 100. Patient up and dressed; was put to bed and bowels opened by enemata. In a few days temperature came down to about 100° F., pulse to 90. Would not stay in bed. Irritation of bladder ceased. Was getting along very nicely until the night of October 26, when he was suddenly seized with a violent pain in his abdomen, while lying in bed. Was seen the next morning. Pain in abdomen very severe, relieved somewhat by emptying the over-distended bladder through a catheter. He had been unable to void urine during the night, although having frequent and urgent desire to do so. Several hypodermics of morphine were necessary, however, before he became easy. An enema was given with little result. His abdomen was moderately distended, and not very tender to the touch. In the evening of the same day he was seen again and found to have considerable pain, which was relieved by a hypodermic. Had vomited some during the day. His pulse was about 90; temperature 99° to 100° F. The following day, October 28, he vomited frequently a coffee-ground looking fluid. On the fourth day, October 29, his condition remained about the same; he could get in and out of bed by himself (he was a large-framed, heavy man, weighing about 225 pounds); pulse regular and not above 90; cheerful; the constant regurgitation of coffee-ground fluid being the most troublesome symptom. On the next day, October 30, he was able to sit up in bed, but his pulse had risen to 100 and his temperature to 100° F. Abdomen still not much distended nor very tender.''

I saw him at eleven o'clock the night of October 30, his condition then was fairly good, temperature and pulse about 100. Abdomen not much distended, rather retracted; muscles, especially the recti, very rigid; tenderness general, but not marked; frequent and copious vomiting of a dark-brownish fluid; countenance pallid and anxious. The diagnosis was general peritonitis, cause unknown, probably appendicitis, although Dr. Stick had from the first suspected typhoid fever with a subsequent perforation of the intestine. The patient had been exposed to typhoid contagion during a recent visit.

As his condition was evidently becoming worse, it was thought best to open the abdomen. The operation was accordingly performed, and under most disadvantageous conditions, about midnight, in a small log house, with very poor light. On opening the peritoneum, it was found to be everywhere intensely congested, of a dark chocolate color; the coils of intestine distended and covered here and there with flakes of exudate. There was a considerable quantity of turbid, feculent fluid everywhere in the abdomen. A perforation was found in the ileum, about six inches from the cæcum, about one and a half centimetres in diameter, with sloughy edges. These were turned in and sutured with Halsted's mattress suture. The peritoneal cavity was cleansed as thoroughly as possible by sponging, the sutured coil irrigated with salt solution and replaced. The appendix was found normal, save the inflammation of its serous covering. The abdominal cavity was thoroughly drained with strips of iodoform gauze, the ends of which were brought out through the wound. The operation took about one hour. His condition at the end was somewhat collapsed, but he rallied under stimulation, administered hypodermically and by rectum. He began to fail, however, and died about seven hours after the operation. No autopsy.

Case II.—J. P. D., aged twenty-six years; single; American; tailor; entered the Medical Ward of Johns Hopkins Hospital August 3, 1895. Family history is negative, except that his father died of some intestinal trouble, the nature of which was unknown, and one brother died, a year ago, of typhoid fever.

Has had diseases of childhood and several attacks of chills and fever at varying intervals. With these exceptions has been well. Smokes much, does not drink, denies venereal contagion. Present illness began six days before entrance, with severe frontal headaches and a slight chill followed by fever. These symptoms have persisted, together with anorexia; no nose bleed. For past two days, diarrhœa; has vomited twice; slight abdominal pain, especially before micturition. Temperature on admission, 103.8° F.; pulse, 92. Blood examination negative as to malarial organism; abdomen generally tender, slightly distended; no rose spots; spleen palpable. Leucocytes 3000 per cubic millimetre.

The patient ran a more or less typical severe typhoid course, up to August 16, A.M., thirteen days after entering the hospital, when the following note appeared in the medical history: "Last night patient began to complain of a sharp pain at base of penis, not relieved by catheterization. Temperature has been rather higher, reaching 105° F.; pulse, 108, regular though soft and dicrotic. Very nervous; abdomen very tense, though not greatly distended. Everywhere tympanitic; complains of pain; tenderness marked; tongue coated; sweating profusely, and frequently cries out with pain; baths discontinued and cold sponging substituted." P.M. "Patient has been comparatively quiet since A.M., but at about 4 P.M. began to cry out and complain of intense pain in abdomen.

Morphine administered hypodermically. Leucocytes, 16,400 per cubic millimetre."

The patient was seen by me with Dr. Thayer at 9.30 P.M., and operation decided upon.

Operation.—Median incision. Peritoneal cavity filled with cloudy, sero-purulent fluid. Peritoneum dark-red and much congested. Coils of intestine distended and covered here and there by flakes of lymph. A single perforation, about one centimetre in diameter, was found in the ileum, about sixteen centimetres from ileo-cæcal valve. It was situated, apparently, in the centre of a thickened Peyer's patch, and had sharply punched-out edges. Numbers of raised, red areas could be seen here and there along the lower few feet of the ileum. The loop containing the perforation was drawn out of the abdomen, carefully cleaned of the exuded lymph and fæcal matter, and the rent closed transversely with eight fine, black-silk mattress sutures (Halsted's). Owing to the rigidity of the abdominal walls and the distention of the bowels puncture of the intestine in several places was necessary, in order to allow of the escape of gas. The loops of intestine were carefully cleansed by irrigation with hot salt solution, and the entire peritoneal cavity thoroughly wiped out with dry gauze. Iodoform gauze was used for drainage, and the abdominal wound closed except where the gauze drainage was brought out.

At end of operation, which lasted a little over an hour, the patient was somewhat collapsed; temperature 103.3° F.; pulse, 150; respiration, 56. He recovered from this somewhat, under vigorous stimulation, and in four hours his temperature was 101.6° F.; pulse, 130; and respiration, 28. His condition did not change materially, except that he became gradually weaker, and died twenty-six hours after the operation. I regret to say that no bacteriological examination was made, and no autopsy allowed.

CASE III.—Charles H., German, aged forty-seven years; married; laborer; admitted to Johns Hopkins Hospital August 15, 1896. Family history good; no cancer or tuberculosis. Has had the usual diseases of childhood, since which time has been strong and well, except an attack of malaria with chills and fevers eight years ago. This attack lasted four weeks. Denies venereal disease; smokes and drinks in moderation. One week before was taken ill with a headache, general malaise, and loss of appetite, and later in the day had a distinct chill, followed by fever. Next day felt somewhat better, but was weak and unable to work. He kept in bed until his admission to the hospital one week later. During this time had had several chills and more or less fever, appetite fairly good, but had eaten nothing but liquids and soft solids. He had no epistaxis nor vomiting; no pain, no diarrhœa, bowels had been regular. At about 8 o'clock on the evening before admission (August 14), while at stool, he was seized with sharp, stabbing pains in right side of abdomen with marked tenderness to the touch. Nausea and vomiting were present. His physician was called in and gave him morphine hypodermically which relieved the pain. He passed a fairly comfortable night and was brought to the hospital early the next A.M., when the following condition was noted:

Face pallid and expression anxious; tongue coated, margin and tip clean and red. Temperature, 101° F.; pulse, 116, regular and of good volume. Lungs and heart negative; abdomen is uniformly distended, no undue prominence in any region noted; skin normal; tympanitic throughout; rigidity of abdominal muscles throughout, especially of the right rectus in its lower part. In iliac region indistinct tumefaction felt; tenderness general, but more marked over right lower quadrant. Rectal examination negative; no eruption on skin; urine showed nothing abnormal.

A diagnosis of beginning general peritonitis, probably due to appendicitis, was made. I confess, at the time, the possibility of perforating typhoid ulcer did not occur to me.

Immediate operation advised and agreed to. After the usual preliminary preparation the abdomen was opened through an incision along outer border of right rectus. Abdominal wall distinctly œdematous. The peritoneum was everywhere intensely congested, roughened and dull, with flakes of plastic lymph. In the pockets between coils of intestine and extending down into the pelvis there was an accumulation of thin, yellowish, turbid fluid containing flakes of exudate. There was no marked fæcal odor to this fluid. The intestines were distended, congested, and dark-colored. In passing towards the median line and hypogastric region the congestion and peritonitis became less marked, and in the upper left quadrant the peritoneum seemed fairly normal. At no place was there the slightest attempt apparent at walling off the inflammatory process. The appendix was found in its normal position, somewhat thickened and congested, and constricted at about its centre, due to old adhesions. It was ligated, excised, and stump covered with peritoneal cuff. About fourteen inches from ileo-cæcal valve, in the ileum on its free border, a small hole, about four millimetres in diameter, was found. It was sharply defined, edges bright red and thickened. It was in the middle of what appeared to be a swollen and enlarged Peyer's patch. Soft yellow fæcal matter was exuding from the opening. Opposite the ulcer was a mesenteric gland enlarged to the size of an olive, soft and of a bright red color. The loop of ileum was brought out through the wound and packed about with gauze. The edges of the ulcer were turned in and sutured with eight mattress sutures of fine black silk. The edges of the ulcer were not excised. After suturing, the loop was thoroughly cleansed with salt solution and dry gauze and returned, the peritoneal cavity thoroughly and systematically wiped out with pledgets of dry gauze. Some distance below in the ileum a second swollen Peyer's patch could be made out. Bismuth gauze in strips was packed loosely about the sutured portion, and the ends brought out through the lower end of the incision. The rest of it was closed with buried sutures of silver wire. The wound was dressed with silver-foil and sterile gauze. His condition at the end of the operation was good. Time of operation one and a half hours. Pulse, 120, and of good volume; respiration, 20 to 25, regular; color good; no sweating or coldness of extremities. Shortly after operation an enema of several ounces of black coffee and peptonized milk given.

August 16. Patient passed a fairly comforable night. Pain not so severe as before operation; very little distention; says he feels better. Temperature and pulse still somewhat elevated, 102° F. and 110 respectively. His general condition improved steadily for about a week, when his temperature and pulse began to go up a little. His tongue became more coated, but abdomen not distended nor tender. Spleen not palpable; no rose spots. An offensive discharge of pus from the right ear indicated an otitis media. About this time a severe pain in the lower part of left thorax developed. Auscultation detected a slight friction rub beginning just below the nipple and running into axillary line.

Blood cultures aspirated from spleen were negative. His temperature and pulse almost reached the normal on August 28, and remained there for a week, when a sharp rise, accompanied by a chill, occurred. His second relapse was quite a severe and prolonged one, so much so that he was transferred to Dr. Osler's ward, where he could be given the cold-bath treatment more conveniently.

On September 14, the following note was made by Dr. Osler: "Tongue a little dry; temperature has been continuously elevated since September 5. Between 6th and 9th not above 100° F. Since 9th above 101° F. On the 12th and 13th, 104° F., and on 14th, 105° F.; pulse, 128. Complains of pain in abdomen, which is flat and natural looking. Respiratory movements well marked; no tension; everywhere soft. Pain referred to hypogastric region and about navel. Edge of spleen not palpable." During the ten days, from September 17 to 27, his temperature ranged about 103° F., occasionally going above 104° F. He was given thirty-eight tub-baths during this period. It reached the normal on October 6, and remained there.

During this time he developed great tenderness in the toes of both feet, and extending up the front of right leg to the knee was some redness and stiffness. This gradually subsided. Several small furuncles on buttocks and sacrum appeared, which were opened. On October 23 he was well enough to be up for the first time. Improved steadily up to November 2, when a phlebitis of right femoral vein with pain and swelling of leg developed. This gradually subsided, and he eventually made a perfect recovery.

Cultures taken at the time of operation from the peritoneal cavity and edges of ulcer showed pure culture of bacillus coli communis.

CASES COLLATED FROM LITERATURE.

MIKULICZ: *Volkmann's Sammlung klinischer Vorträge*, No. 262, April, 1884. —Man, aged forty years, in a very mild attack, had a sudden severe pain in abdomen on jumping out of bed; vomiting and slight distention of abdomen. Condition three days later fairly good; pulse, 100; temperature, 37.8° C.; frequent vomiting of bile-stained fluid not stercoraceous; abdomen distended and generally tender.

Operation.—On opening peritoneal cavity about one litre of foul-smelling pus flowed out; intestines intensely red, congested, and covered with fibrinous exudate, and adherent to each other; pieces of potato floating in pus; perforation four by six millimetres, with long diameter parallel to axis of intestine, opposite the insertion of mesentery; soft yellow fæces exuding; mesenteric glands swollen and soft. Median incision, fifteen centimetres; peritoneal cavity irrigated with 5-per-cent. carbolic-acid solution; edges of ulcer excised and closed with twelve silk stitches; lumen of bowel somewhat encroached upon; abdomen closed; no drainage; microscopic examination of edge of ulcer showed nothing characteristic.

Preliminary Diagnosis.—Purulent peritonitis; intestinal obstruction. Patient was restless and complained of much pain. Abdominal wound suppurated and was reopened later. Slow but complete recovery.

WATSON: *Boston Medical and Surgical Journal*, Vol. CXXXIV, No. 13, 1896.—September, 1895. Man, aged twenty-eight years, in seventh week had sudden severe pain in right iliac region with rise of temperature. Twelve hours later area of induration in right iliac region about size of palm of hand; signs of collapse; less pain; features pinched; cyanosis and sweating.

Operation.—Right lateral incision. Peritoneum thickened and loop of small intestine adherent to abdominal wall by recent delicate adhesion; in centre of adherent area a perforation size of end of thumb; fæces oozing out; localized but no general peritonitis. Edges of perforation excised and sutured with continuous suture; no other ulcer found; wound closed.

Diagnosis.—Typhoid ulcer. Good deal of shock, but soon rallied. Recovery uninterrupted. Left hospital in three weeks.

TAYLOR: *Lancet*, London, 1890, Vol. I, p. 961.—December, 1888. Man, aged thirty-three years, during relapse in fourth month of severe attack developed abdominal pain and distention. Onset of symptoms gradual, becoming more severe. Ten days after onset tumor in median line between umbilicus and ensiform, which had appeared with abdominal pain, and increased steadily in size. Severe attacks of hæmatemesis, very alarming on one or two occasions; tumor prominent and rounded and fluctuated, continuous with liver, which was not displaced.

Operation.—Median incision. Peritoneum adherent to what seemed to be left lobe of liver; cavity large and well walled off; cyst opened, and evacuated about three pints of brown turbid fluid; exact situation and relation of cyst not determined; drainage-tube inserted and wound closed.

Diagnosis.—"Cystic tumor involving left lobe of liver." Condition good. Convalescence rather slow, but recovery complete.

PARKIN: *British Medical Journal*, Vol. I, 1895, p. 192.—September, 1894. Woman, aged thirty-two years, in third week of severe attack, had sudden and severe pain at umbilicus; collapse; temperature, 101° F.; abdomen tense and hard in a few minutes; two involuntary movements of bowels; liver-dulness absent; pulse quick and weak; respiration quick and shallow; morphine and atropine given hypodermically. In two hours had recovered somewhat, and condition about as before onset except for absence of liver-dulness and abdominal rigidity.

Operation.—Under chloroform and then ether. Median incision. Considerable amount of gas and yellow turbid fluid escaped on opening peritoneal cavity; many ulcers seen in ileum; perforation about two feet from cæcum in large ulcer; perforation very small and fæces oozing out; no other perforation. Ulcer folded longitudinally and sutured with continuous Lembert suture; some difficulty because of congested state of gut; peritoneal cavity irrigated with weak carbolic solution; tube inserted and wound closed.

Diagnosis.—Typhoid perforation. Condition better than before operation; no pain; liver-dulness had returned five hours later. For two days condition improved; then delirium, and temperature 102° F.; after trying to get out of bed sudden pain in abdomen and death ten hours later on third day.

Autopsy.—Wound had repaired well. No peritonitis around suture; close to cæcum was a large ulcer with very thin floor devoid of peritoneum, and around this peritonitis. Suture held tight. Ileum, for three inches from cæcum, was ulcerated all around with only islets of mucous membrane here and there. No perforation found, but thorough examination not made.

HOTCHKISS: *New York Medical Journal*, Vol. LXIII, No. 2, January 11, 1896. —August, 1895. Man, aged twenty-four years, in the third week of moderate attack, was seized with sudden intense pain in abdomen. The abdomen was considerably distended and exquisitely tender; face anxious and drawn; pulse rapid; temperature high; vomiting.

Operation, twelve hours later. Median incision. Peritoneal cavity was full of cloudy serous fluid, containing flakes of fibrin and some fæcal matter. The peritoneum was everywhere deeply congested and covered with fibrin; no adhesions. The mesenteric glands enlarged and distinctly visible. There was a perforation five inches above the valve, quite small, and the tissue surrounding it quite soft and friable. Edges of perforation turned in longitudinally and sutured with Lembert's sutures; peritoneal cavity thoroughly irrigated with hot normal salt solution; gauze packing; wound partly closed.

Diagnosis.—Typhoid perforation. Patient recovered consciousness, but pulse weak; collapse; temperature rising to 108° F.; death four and a half hours after.

Autopsy.—Showed condition noted above; no other perforation and no leakage from suture.

HOLLIS: *Lancet*, May 9, 1896, p. 1284.—March, 1896. Man, aged thirty-three years, in third week of a typical typhoid, had sudden attack of abdominal pain, distention, and vomiting. The abdomen was very rigid and distended.

Operation, few hours later. Median incision. Peritoneal cavity full of gas, blood, and fæcal matter. Perforation eight inches from valve. Perforation sutured with Lembert's sutures after inverting edges; peritoneal cavity irrigated and wound closed.

Diagnosis.—Typhoid perforation. Patient was much collapsed and died thirty-six hours after operation.

Autopsy.—Peritoneal cavity quite clear; no other perforation; sutures held well and process of repair well established. There was beginning necrosis at lower end of line of sutures, but no perforation as yet. Several other thickened Peyer's patches, but no tendency to sloughing elsewhere.

RICKETTS: *Cincinnati Lancet-Clinic*, Vol. XXXIV, No. 14, 1896.—January, 1895. Man, aged thirty-five years, in third week, while at stool in erect position, had sharp sudden pain in right iliac fossa followed immediately by collapse. Pain severe; abdomen distended and tender on right side; temperature, 100° F.

Operation, seventy-three hours after. Omentum and intestines much matted together and peritoneal covering much thickened and congested; great quantity of offensive pus, with flakes of lymph (two quarts evacuated). Appendix not perforated, but was removed. No perforation found. Peritoneal cavity irrigated with warm water and gauze drain inserted.

Diagnosis.—Typhoid ulcer perforating. Patient was much collapsed in spite of vigorous stimulation, and died eleven hours later. No autopsy.

B. F. KINGSLEY, San Antonio, Texas: (Personal communication.)—September, 1894. Girl, aged sixteen years, in second week of moderate attack, had sudden chill and symptoms of collapse; pain not very marked; pulse rapid and irregular. Just preceding this had had several bloody stools and some abdominal pain and tenderness. Fifteen hours later somewhat collapsed; pulse rapid and weak; pale, anxious expression; abdomen distended and tympanitic and tender everwhere.

Operation.—Median incision. Abdomen contained considerable quantity of cloudy serum and small clots. Perforation in ileum, diameter of lead-pencil, and several other Peyer's patches, red and apparently ulcerated through mucous and muscular coats. Here and there patches of organized lymph and fæcal matter. Peritoneum greatly congested and dull; edges of perforation pared and sutured with two rows of Lembert's sutures; peritoneal cavity irrigated with hot saline solution and patches of lymph peeled off. Abdomen closed.

Diagnosis.—Typhoid ulcer perforating. Death five hours after operation. No autopsy.

JOSEPH PRICE: *Medical and Surgical Reporter*, Philadelphia, November 7, 1896.—October, 1896. Woman, aged thirty years, in third week of typical attack, had "well-developed symptoms of peritonitis" with an ill-defined tumor in right iliac region.

Operation.—Well-marked adhesions found in ileo-cæcal region; adhesions easily freed and two perforating ulcers found a few inches above valve in ileum; foul purulent fluid about perforations; mesenteric and retroperitoneal glands enlarged. Injected portion of omentum with appendix removed; holes in ileum trimmed and sutured; peritoneal cavity irrigated; glass and gauze drainage.

Diagnosis.—Typhoid perforation. Recovery.

SENN: *Medical News*, Vol. LIV, p. 622, June 8, 1889.—March, 1889. Man, aged twenty-two years, in the third week of very mild attack,—in which temperature never above 101° F., bronchitis marked, and never confined to bed,—had sudden acute attack of pain in left iliac region, followed by vomiting which later became stercoraceous. Three days later, during which constipation obstinate, the abdomen was very tense and tympanitic, except in left iliac region; here dull and very tender; liver-dulness displaced upward; patient collapsed and pale; pulse, 140; temperature, 101° F.; cracked-pot resonance on percussion.

Operation, under chloroform, one hour. Median incision. Peritoneum everywhere congested; intestines livid, much distended, and covered with lymph; volvulus of several loops of upper part of ileum; in left iliac fossa about a pint of fluid fæces; perforation six inches from valve; small opening on convex side of bowel in gangrenous patch. Gangrenous portion turned in by eight interrupted Lembert's sutures; lumen of intestine narrowed to one-half its size; peritoneal cavity thoroughly flushed with one-third of one-per-cent. solution of salicylic acid. Intestines could not be replaced on account of distention, so incised and contents evacuated; ileum cleansed, closed, and returned without difficulty. Abdomen closed and glass tube inserted.

Diagnosis.—Bronchitis chief symptom until pain in left side. Volvulus with obstruction. Three hours after operation complete collapse. Died ten hours after operation.

Autopsy.—Diffuse septic peritonitis; sutures held; few ounces of bloody serum in peritoneal cavity; liver and spleen enlarged; three other ulcers in ileum below perforation.

SIFTON: *Chicago Clinical Review*, Vol. IV., No. 7, April, 1895.—January, 1895. Man, aged thirty-nine years, in fourth week of somewhat irregular and severe attack,—temperature remaining up to 104° to 105° F. in evening,—during a movement of the bowels had sudden severe pain in ileo-cæcal region. Eleven hours later was in state of collapse; profound sweating; temperature subnormal; respiration rapid and shallow; face pinched and anxious; pulse fairly good; abdomen tender and distended; severe pain; recti muscles rigid; tenderness in right iliac region.

Operation, under chloroform, forty minutes. Right lateral incision through linea semilunaris. Peritoneum much congested; one pint of liquid fæces flowed out; many patches in ileum varying in size from pin-point to an inch or more in diameter, extending about six feet on ileum and about four to ten per foot; bowel moderately distended; perforation one-sixteenth of an inch in diameter on convex side of intestine two feet from valve, fæces escaping from it; general peritonitis. Perforation closed with two rows of Lembert's sutures (difficult because of brittleness of intestine and stitches cut out). A second point, ten inches higher up, was found so nearly perforated that it was also sutured; abdominal cavity irrigated; iodoform-gauze drain into pelvis and abdomen closed.

Diagnosis.—Typhoid fever; two perforations. Patient in fairly good condition at end of operation; next morning pulse 140, weak; temperature subnormal; no pain; not so tender. Dressings stained, changed daily; drain removed on seventh day and wound packed; temperature ranged from 101° F. to subnormal; pulse 112 to 120. On fourth day an ounce of Rochelle salts given to relieve distention; after this frequent stools for two weeks. Abdominal sutures cut out and were removed. Recovery.

Bland Sutton and Cayley: *British Medical Journal*, March 17, 1894, and *Clinical Society's Transactions*, London, Vol. XXVII, p. 137, February, 1894. Man, aged twenty-five years, in fourth week of mild attack, was "seized with symptoms of perforation," intense abdominal pain, vomiting, and diarrhœa; temperature 97° F.; collapse marked. Five and a half hours later had recovered somewhat from collapse and condition fairly good; abdomen distended; temperature 103° F.

Operation, one hour. Pelvis full of fæces and gas; perforation in centre of an oval ulcer twelve inches from valve; one enlarged mesenteric gland; no other ulcer visible. Ulcer excised by oval incision and cut edges of mucous membrane drawn into apposition by continuous silk suture, and peritoneal surfaces brought together by Lembert's sutures; peritoneal cavity freely irrigated with warm water; abdomen closed.

Diagnosis.—Typhoid fever and perforation. Patient was much collapsed, but gradually rallied under stimulation and heat. No pain nor symptoms of peritonitis; much hiccough and eructation; slight fæcal fistula. Died on sixth day.

Autopsy.—No peritonitis; no escape of fæces; leakage of gas. "Death due to exhaustion."

Joseph Price: *Medical and Surgical Reporter*, Philadelphia, November 7, 1896.—January, 1895. Woman, aged twenty-eight years, in third week. Unconscious before operation.

Operation.—"General angry peritoneum with filthy bowel contents and filthy inflammatory products throughout the peritoneal cavity;" peritoneal contents had marked fæcal odor. "Thorough irrigation and drainage; all adhesions freed; multiple bowel fistulæ sutured."

Diagnosis.—Typhoid perforation. Recovery.

Joseph Price: *Medical and Surgical Reporter*, Philadelphia, November 7, 1896.—June, 1896. Woman, aged twenty-six years, had rapid pulse and high temperature; symptoms of peritonitis quite general and alarming emaciation.

Operation.—"General adhesions in region of ileum and right groin;" large ragged perforation in ileum with circumscribed extravasation of fæcal matter. Peritoneal cavity thoroughly irrigated; perforation trimmed and sutured; glass and gauze drainage.

Diagnosis.—Typhoid ulcer. Recovery. (This case had marked tubercular deposit in lungs.)

N. P. DANDRIDGE, Cincinnati, Ohio: (Personal communication).—1895. Boy, aged nine years, in third week of mild attack had sudden abdominal pain and tympanites. Three days later enormous abdominal distention and apparently greater resistance in right iliac fossa.

Operation.—Right lateral incision. On opening the peritoneal cavity there was an immediate escape of gas and the abdominal wall collapsed. The gas was free in peritoneal cavity and the intestines not at all distended. Then followed a large amount of foul pus which also seemed free in the cavity. The peritoneum covering intestinal loops was smooth and free from adhesions. The appendix was not seen nor was there any opening in the bowel found.

Diagnosis.—Typhoid fever. Recovery.

C. B. PORTER, Boston, Mass: (Personal communication).—October, 1896. Man, aged twenty-five years, in third week of moderate attack had sudden and severe abdominal pain with sweating and rapid and weak pulse. Eleven hours later temperature, 101.8° F.; pulse, 112; profuse sweating; pinched expression; abdominal muscles hard and resistant, generally tender, slightly tympanitic; liver-dulness not observed; knees drawn up. Blood, white corpuscles = 14,700 (five days previously = 6500).

Operation.—Median incision five inches long. On opening peritoneal cavity distended bowel presented in wound, some turbid serum escaped, but no fæcal matter seen; odor suggested fæces. Ulcer found thirty centimetres from cæcum; several other ulcers observed; flakes of fibrin adherent to intestinal coils here and there; gas but no fæcal matter exuded from opening; indurated area about perforation. The coil of intestine presenting was drawn out of wound and perforations sought for systematically; ulcer stitched with fine silk; line of suture transverse to axis of bowel; edges inverted; two rows of sutures used; abdomen thoroughly wiped out; wick of gauze put down into pelvis on either side and one above.

Diagnosis.—Typhoid fever; perforating ulcer. Patient somewhat shocked, but reacted well under vigorous stimulation; pulse, 150; came out of ether and felt better than before operation; less pain. At first seemed to improve; pulse and temperature subsided; passed fæcal matter and gas and retained some nourishment; but later began to fail, and died on third day, sixty-one hours after operation.

Autopsy.—Stitches found to hold perfectly; lumen diminished about one-half and choked with rather firm, dry, fæcal mass which seemed to be moulded into the narrowest portion; union of sutures firm; no leakage. Typhoid ulceration of ileum; acute general fibrous peritonitis; intestinal suture for perforating ulcer; acute degeneration of liver and kidneys; infarction of spleen. Typhoid bacilli were found in the spleen and liver. Sections through the sutured intestine show the healing process well under way.

GREIG SMITH: "Abdominal Surgery," Second Edition, 1888, p. 731, 1885.—In his work on "Abdominal Surgery," Greig Smith reports a case that he operated on in 1885. He opened the abdomen for a large collection of pus and fæcal matter which may have had its origin in typhoid perforation. Partly digested food as well as the material of rectal enemata came out through the parietal fistula. Patient lived four weeks and died of exhaustion. Diagnosis not verified by autopsy.

BARTLETT, reported by Morton: *Medical News*, November 15, 1887.—1886.

Median incision; great fæcal extravasation; perforation hurriedly sought for and not found; abdominal cavity irrigated; drain put in and incision closed.

Diagnosis.—Typhoid perforation. Died on second day.

VAN HOOK: *Medical News*, Philadelphia, Vol. LIX, No. 21, November 21, 1891. —June, 1891. Woman, aged thirty-one years, in seventh week of mild attack, during relapse had sudden intense pain in ileo-cæcal region following shortly after administration of enema and movements of bowels. Ten hours later, temperature, 106° F.; pulse, 132, weak and wiry; expression anxious; marked shock; great tympanites; abdomen tense; tenderness over ileo-cæcal region; liver-dulness not altered.

Operation.—Incision in median line; no gas escaped, but more than a pint of liquid fæces and exudate mixed with flocculi of lymph; flocculi of lymph over surface of bowels. All the peritoneum and intestinal coils intensely congested and dull-looking; fæcal matter free in peritoneal cavity; many ulcers seen, several of them almost perforating; small perforation found. Perforation sutured with three rows of Lembert's sutures because of brittleness of intestinal wall; peritoneal cavity irrigated with large amount of hot water; omentum drawn over sutured intestine; drainage-tube; wound sutured.

Diagnosis.—Typhoid perforation. Patient was "much exhausted; pulse rapid and small, and temperature high." Next morning the abdomen was much swollen and tender and the patient looked moribund. Enemas of one ounce each of magnesium sulphate, glycerin, and water, at 11 o'clock; on third repetition bowels began to move,—twelve movements; improved from that time; fever continued two and a half weeks and ended in normal defervescence. Recovery.

VAN HOOK: *Medical News*, Philadelphia, Vol. LIX, No. 21, November 21, 1891.—June, 1891. Woman, aged twenty-nine years, probably in third or fourth week of typhoid, had very sudden and severe pain after getting out of bed and walking about the ward. Seven hours later, in collapse; abdomen tense and rigid and distended; pulse rapid and thready; skin cold and clammy; liver-dulness absent.

Operation not completed on account of collapse. The "peritoneal cavity was filled with a thin liquid feculent material."

Diagnosis.—Typhoid perforation. Died.

Autopsy.—Perforation eighteen inches from valve; a second ulcer found opening into small abscess cavity shut off completely by adhesions.

VAN HOOK: *Medical News*, Philadelphia, Vol. LIX, No. 21, November 21, 1891.—October, 1891. Man, aged thirty-five years; temperature, 102° F.; pulse, 120, small and irregular; abdomen distended, rigid, dull, and very tender; liver-dulness absent; patient collapsed.

Operation.—An ulcer was found twelve inches above valve; peritoneal cavity filled with fæces and exudate. Perforation closed with double row of Lembert's sutures; irrigated and drained.

Diagnosis.—Typhoid perforation. At end of operation condition of patient "fair." Died fourteen hours after the operation. The perforation had been completely closed.

KIMURA: *British Medical Journal*, 1890, Vol. II, p. 777.—April, 1890. Man, aged thirty-four years, collapsed and almost moribund, twenty-eight hours.

Operation.—Small perforation found two inches above cæcum. Edges turned in and sutured with ten interrupted Lembert sutures; peritoneal cavity irrigated with boracic acid solution; drainage-tube; wound closed.

Diagnosis.—Typhoid ulcer. Died nine hours later.

NETSCHAJEW: *Balnitsch Gazette Botkina*, No. 23, St. Petersburg, 1894; *Medical News*, Philadelphia, 1894, p. 609.—1894. Man, aged twenty-five years, in third week had severe abdominal pain and a feeling of weakness. Seventeen hours later "symptoms of general peritonitis."

Operation.—Peritoneal cavity filled with sero-purulent fluid and flocculent exudate; peritoneum everywhere turbid and congested and here and there covered with fibrin flakes. Small perforation twenty centimetres from valve; pin-point opening; gas and fæces exuding; an elliptical area, four centimetres long, excised and wound closed with Czerny-Lembert's sutures of silk; peritoneal cavity cleansed with dry gauze and all empty spaces carefully packed with gauze.

Diagnosis.—Typhoid ulcer perforating. Gauze was removed on seventh day; condition good; temperature declined gradually in course of three weeks. In nine weeks edges of abdominal wound freshened and sutured; healed by first intention. Good recovery.

ALLINGHAM: *British Medical Journal*, 1894, Vol. I, p. 578.—In discussion of Mr. Bland Sutton's case, Mr. H. Allingham said that he had operated upon one case in which the openings in the bowel were so rotten that he brought them to the abdominal opening and stitched them there; but the patient died.

BONTECOU: *Journal of the American Medical Association*, Vol. X, January 28, 1888.—October, 1887. Man, aged twenty-five years, in third week of moderate attack was seized with an attack of nausea with pain in right iliac region, which increased next day. Two days after onset there was hiccough and vomiting of prune-juice looking fluid; bowels constipated and abdomen tympanitic; pain marked especially in right iliac region; temperature 104° F.; legs drawn up; surface cold and clammy and perspiring; countenance pale and anxious.

Operation.—Under ether. On opening peritoneal cavity considerable quantity of "flaky, dark-colored serum" escaped; appendix ulcerated and perforated at its base; ligated and removed; ileum perforated ten inches from valve, opening of small size; ileum everywhere deeply congested and dark in color and distended. Perforation edges turned in longitudinally and sutured with Lembert's sutures; abdominal cavity irrigated with weak bichloride solution. Median incision.

Diagnosis.—Typhoid ulcer perforating.

Patient was much collapsed and death occurred before recovery from ether.

MORTON: *Medical News*, Philadelphia, December 24, 1887.—November, 1887. Man, in third week of mild walking case, had excruciating pain in right iliac region with chill, elevation of pulse, temperature, and respiration, following the eating of a hearty meal of meat, etc. Twenty hours later temperature 104.5° F.; pulse 156; and respiration 45; abdomen much distended, painful, and tender; condition good.

Operation.—Peritoneum everywhere intensely congested and swollen; intestines much dilated; peritoneal cavity filled with yellowish serum with flakes of purulent lymph, gas, and fæces; perforating ulcer three-eighths of an inch in diameter three feet from valve; a second necrotic spot a short distance above this; ecchymoses here and there under the peritoneum on intestine. Edges of ulcer turned in by eight Lembert sutures; second necrotic-looking spot also sutured; peritoneal cavity irrigated with hot water and sponged dry; glass drainage-tube.

Diagnosis.—Typhoid ulcer perforating. Condition of patient not very good; temperature, pulse, and respiration remained very high, and six hours after operation sank into collapse, and died seven hours after operation.

Autopsy.—Intestines covered with recent lymph and injected; ecchymotic spots seen in intestines; ulcers extended for eight feet from valve; sutures held and did not leak under forcible distention; glands enlarged; peritoneal cavity clean and free from fluid; edges of abdominal incision glued together.

LÜCKE, of Strasburg: *Deutsche Zeitschrift für Chirurgie*, 1886–87, Bd. xxv, 1–4; abstracted by Morton in *Medical News*, November 26, 1887, p. 617.—October, 1886. Woman, aged twenty-eight years, in second week of mild attack which followed immediately after confinement, had sudden intense abdominal pain with collapse, chills, and cold perspiration; pulse 180; vomiting and tenesmus. Few hours later the extremities were cold; pulse small and weak; abdomen distended and painful; shock great.

Operation.—Median incision; abdominal wall œdematous; peritoneal cavity filled with dark flaky feculent fluid; intestines much congested and covered with fibrinous exudate and glued together; small perforation about a foot and a half from valve, from which flowed yellow fæces; cæcum and appendix negative; mesenteric glands enlarged. Portion of bowel including the ulcer excised and sutured with Lembert's sutures; peritoneal cavity irrigated and cleansed with a salicylic solution; large drain inserted and abdomen closed.

Diagnosis.—Typhoid ulcer perforating. Patient was in profound shock, from which she did not recover. Died in eleven hours.

Autopsy.—Pneumonia and hypostatic congestion; foul pus in Douglas's fossa and exudate everywhere over peritoneum; drainage-tube obstructed entirely by a kink; abdominal wound all right, but intestinal wounds had not done well and edges inflamed and necrosed.

ABBE: *New York Medical Record*, January 5, 1895.—November, 1894. Woman, aged twenty-one years, in third week of typical attack, had sudden pain, vomiting, and collapse; temperature 102° F. Two days later abdomen distended; tongue dry and coated; dulness along right Poupart's ligament and hypogastrium; pulse 140; temperature 104° F.

Operation.—Under ether; median incision. Purulent peritonitis; coils of intestine distended and covered with lymph; a pint of pus in pelvis; several thick and inflamed Peyer's patches; perforation one-quarter of an inch in diameter in ileum; peritoneal cavity irrigated with bichloride of mercury solution, 1 : 20,000; sutured with Halsted's suture; iodoform gauze packing, and wound left open. Time three-quarters of an hour.

Diagnosis.—Typhoid fever perforation. Condition of patient good. Slight fæcal fistula for two weeks. Recovery.

THOMPSON: *Transactions of Texas State Medical Association*, 1893.—October, 1892. Man, aged thirty-six years, in third week (?) of mild attack had sudden severe pain in abdomen followed by vomiting. Four days later temperature 103° F.; pulse 120 and thready; respiration 25; abdomen much distended and everywhere tympanitic and very tender; pain intense, especially at umbilicus; hiccough troublesome and repeated vomiting; liver-dulness present.

Operation.—Median incision. Peritoneum much congested; much thin purulent fluid in peritoneal cavity; much lymph and fæcal matter loose in peritoneal cavity;

intestines much distended, tapped with trocar; perforation one foot from valve, one-quarter of an inch in diameter, with clean cut edges. Intestines covered with hot bichloride towels; edges of ulcer cleaned and closed with interrupted sutures and then continuous suture in serous coat; calibre of gut much diminished; peritoneal cavity irrigated with hot boric solution; drainage-tube in Douglas's fossa; mesenteric glands enlarged and inflamed.

Diagnosis.—Probable appendicitis; possible internal strangulation; typhoid not suspected. Patient much collapsed, but soon rallied. Died eleven hours after operation.

Autopsy, showed characteristic typhoid lesions; sutures held perfectly, and plastic lymph thrown out over them.

BONTECOU: *Journal of the American Medical Association*, Vol. XIV, p. 455, 1890.—October, 1889. Man, aged twenty-seven years, in sixth week of typical attack had sudden acute pain and symptoms of peritonitis. Seventeen hours later moderate collapse; pulse frequent; bathed in perspiration; abdomen tense and tympanitic; liver-dulness absent; condition on whole favorable.

Operation.—Under ether. Median incision. Peritoneum much congested and red; gas, fæcal matter, as well as large amount of brownish sero-purulent fluid in peritoneal cavity; intestines much distended and covered with organized lymph; appendix congested; perforation of ileum through a Peyer's patch four or five inches from valve, through which fæces were escaping; several other patches in lower eighteen inches of ileum much enlarged and thickened; perforation three-sixteenths of an inch in diameter. Edges of ulcer turned in transversely; continuous Lembert suture; peritoneal cavity thoroughly irrigated with boiled water; wound closed, a large rubber drainage-tube inserted; iodoform freely used.

Diagnosis.—Typhoid fever perforation. Patient in much same condition as at beginning of operation; pulse improved for a time, but he became delirious, tore off dressings, and pulled out drainage-tube; soon after collapsed and died twelve hours after operation. No autopsy.

BRIDDON: ANNALS OF SURGERY, Vol. XXIII, No. 2, 1896.—October, 1895. Boy, aged eighteen years, had been supposed to be entirely well for three weeks when he had sudden acute pain in abdomen. Three days later had marked symptoms of peritonitis.

Operation.—Median incision. Intestines distended, congested, and covered with exudate; considerable amount of pus in peritoneal cavity; appendix normal; perforation nine inches from valve on free border of intestine; fæces came out of the small opening; no walling off. Perforation closed by double layer of Lembert's sutures; peritoneal cavity irrigated with large quantity of normal salt solution; iodoform-gauze packing; wound left open.

Diagnosis.—Typhoid ulcer. Condition after operation bad. Died in a few hours.

Autopsy showed perforation tightly sealed; Peyer's patches in lower ten inches of ileum markedly ulcerated.

BOGART: ANNALS OF SURGERY, Vol. XXIII, No. 3, 1896.—November, 1895. Man, aged thirty years, in fourth month of typical attack with two relapses, had severe pain in lower part of abdomen with nausea, vomiting, chill, and diarrhœa; temperature 104° F. Twenty hours later rigidity and marked tenderness of abdomen, especially in lower half on right side; abdomen slightly distended; pulse 108 and weak; expression anxious and pale; temperature 101° F.; respiration 36.

Operation under ether. Oblique right incision. Small quantity of sero-purulent fluid in abdominal cavity; appendix found adherent to ileum four inches from valve, and at this point a minute perforation of the bowel apparently closed completely by adhesion; gas and mucus exuded. Loop of intestine drawn out and perforation sutured with continuous Lembert's suture of silk; irrigated; appendix and mesentery ligated and removed; iodoform-gauze packing; wound partly closed.

Diagnosis not made. Condition good; pulse 126; temperature 98.8° F.; respiration 36. Condition good for forty-eight hours; then after cathartic (magnesium citrate) and enema had severe abdominal pain; symptoms of intestinal obstruction; opened up, but operation abandoned on account of bad condition. Died on the fourth day.

Autopsy.—Intestinal suture sound; perforation in centre of good-sized ulcer; stricture of colon at hepatic flexure caused by old adhesive bands from gall-bladder, producing complete obstruction by angle formed.

MIKULICZ: Reported in *Verhandlungen der deutschen Gesellschaft für Chirurgie*, XVIII Congress, p. 324, Case No. 2.—December 1887. Man, aged twenty-two years, at the beginning of the third week of a moderately severe attack of typhoid fever, marked collapse and pain. Four and a half hours after first symptoms had a pulse of 170, scarcely perceptible; cold sweat; vomiting; mind clear.

Operation.—Chloroform narcosis, median incision. Small perforation found and sutured. Peritoneal cavity thoroughly cleansed of the foul-smelling feculent pus with which it was filled; 3-per-cent. boric-acid solution irrigation; iodoform-gauze drainage. Patient came out of ether, but soon collapsed and died four and a half hours after the operation, and nine hours after the beginning of the symptoms of perforation.

Autopsy.—Diffuse general peritonitis. The perforation was very close to the ileo-cæcal valve.

MIKULICZ: Reported in *Verhandlungen der deutschen Gesellschaft für Chirurgie*, XVIII Congress, p. 324, Case No. 3.—August, 1888. Man, aged thirty-eight years, in the second week of typhoid fever, noticed first a very severe diarrhœa, which was followed by obstipation and vomiting. It was thought that he had an ileus at this time. Twenty-four hours later his condition was as follows; fæcal vomiting; much abdominal distention; pulse 130 and weak; cold extremities. Laparotomy performed a day later; two days following beginning of symptoms suggesting perforation.

Operation.—Median incision. A great quantity of purulent, feculent fluid in the peritoneal cavity; coils of intestine distended and adherent to each other. A perforation, size of a five-pfennig piece, found in ileum, this was sutured; intestine and peritoneal cavity cleansed as thoroughly as possible by irrigation and wiping with warm salicylic-acid solution; no drainage. Death in collapse twelve hours after operation.

Autopsy.—Diffuse septic peritonitis; perforation two feet from ileo-cæcal valve; marked swelling of mesenteric glands.

HAHN'S cases, reported by Frank in the discussion of a paper by Steinthal, read before the XVII Congress of German Surgeons, Berlin, 1888, reported in *Beilage zum Centralblatt für Chirurgie*, 1888, No. 24. Frank says, "Hahn has operated upon two cases of typhoid perforation, but both patients died."

In *Beilage zum Centralblatt für Chirurgie*, 1889, No. 29, appears the following note: "Wagner (Königshutte) has recently operated upon a woman, convalescing from typhoid fever, for perforation of an intestinal ulcer, eventration of the intestine, irrigation, suture of wound without drainage. Recovery."

This case is reported in the discussion of Mikulicz's paper, "Weitere Erfahrung über die operative Behandlung der Perforationsperitonitis," read before the XVIII German Surgical Congress in Berlin.

ESCHER, in *Wiener medicinische Wochenschrift*, 1887, No. 19, p. 607, reports the following case: "Man, aged twenty years, considered himself well, except for a small right-sided scrotal hernia, which gave him no trouble. One day at work felt a sudden, sharp pain in abdomen and feeling of faintness, this passed off after a while and he continued work. Was unable to work next day. On fourth day entered hospital. Examination showed abdomen distended and tender everywhere, especially in right iliac region, where there was dulness on percussion and marked muscular resistance. There was swelling of the right scrotum, tenderness, and redness of the skin; patient depressed and anxious; anorexia; no vomiting, but singultus; pulse frequent, but tolerably strong; temperature somewhat elevated.

Operation four days after onset of pain. Hernial sac opened and nothing but turbid serum found; circumscribed collection of foul-smelling pus found in right iliac region. Its appearance suggested a typhoid stool. The intestine was not further examined for fear of infecting the peritoneal cavity. Wound irrigated and packed with gauze. Patient made a slow but complete recovery.

ROUTIER: Reported by Dieulafoy in *Presse Médicale*, Paris, No. 88, October 28, 1896.—1896. Man, in third week of typhoid fever, had sudden attack of severe abdominal pain, with slight distention and sudden fall of 3° C. in temperature; hiccough.

Operation.—Eighteen hours later was operated upon. Some peritonitis with several cubic centimetres of liquid fæcal matter in peritoneal cavity; small perforation in ileum about five centimetres from valve. The perforation was closed with two rows of sutures, placed longitudinally; iodoform powder, gauze drainage. Patient's condition improved for a time, but severe symptoms returned and he died in collapse, ten days after operation.

Diagnosis.—Perforating typhoid ulcer.

Autopsy showed a recent peritonitis with pus and liquid fæces in right iliac fossa; point of suture had healed perfectly; two new perforations were found near the other; the remainder of the intestine presented characteristic typhoid signs.

ALEXANDROFF: *Lætop. Khirurg. obshtsh. v Mosk.*, 1891, X, 121–129 (Annals of the Surgical Society of Moscow).—September 24, 1889. V. L., a boy, nine years, six months old, entered the hospital on the fourth day of an attack of typhoid fever; his brother already in hospital with typhoid; temperature high, pulse rapid, tongue coated, general typhoid appearance; course of fever mild; temperature not over 40.2° C.; slight delirium at night; no intestinal hæmorrhage. On the evening of the 28th there was sudden abdominal pain, with repeated vomiting, and the pulse, which heretofore had been normal, weakened.

September 29, twenty hours after onset of symptoms, patient in very weak condition; abdomen tense, tympanitic, and very tender; breathing rapid; pulse rapid and weak; temperature 40° C.

Operation.—Under chloroform, twenty-five minutes. Median incision. Peritoneal cavity contained large amount of foul cloudy fluid,—fæcal odor; intestine distended and ulcers apparently visible; mesenteric glands swollen; perforation in appendix admitted index-finger; appendix was ligated at base and cut off and edges sutured with silk; fluid removed with sponges, and peritoneal cavity irrigated with boric acid solution; wound partly closed; thick drainage-tube in lower angle; iodoform dressing.

Diagnosis.—Peritonitis following perforation of the bowel. Patient recovered consciousness, but soon collapsed and *died* in twenty minutes.

Autopsy showed nothing material. The excised appendix showed three large ulcers, one at the tip, two on its walls.

JOSEPH PRICE: *Medical and Surgical Reporter*, of Philadelphia, in reporting his three cases, makes the following statement: "Almost coincident with Dr. Wilson's advocacy of cœliotomy for the relief of intestinal perforation in typhoid fever, Dr. Lewis S. McMurtry, of Louisville, Ky., performed an operation, the subject being a physician, and found multiple perforations. He trimmed the holes, closed them with sutures, irrigated and drained, recovery following. A report of this case, with the patient present at the time, was made at the Cincinnati meeting of the American Medical Association."

I have been unable to find any reference to this case in the published reports of the American Medical Association, and a personal letter to Dr. McMurtry elicited no reply.

FERRARESI: *Bull. d. Soc. Lancisiana d. osp. di Roma* (1895), 1896, XV, fasc. 1, 9–14.—November 15, 1894. Woman, aged twenty-four years, had been sick only four days, complaining of headache, general malaise, loss of appetite, backache, some fever; was able to be about until November 14, 1894, when she had sudden attack of violent abdominal pain and vomiting. Later there was some distention and absolute constipation; no passage of gas. Her condition becoming worse, she entered the hospital, November 15, where diagnosis of intestinal obstruction was made; her condition then was very grave; she was much collapsed, countenance drawn; extremities cold; temperature 36 3° C.; pulse 120, weak; respiration 30 and shallow; abdomen much distended, tender everywhere.

Operation.—Under chloroform a median incision was made. Intestine much distended, coils in the lower part of abdomen deeply congested and covered with flakes of fibrin. There was much foul-smelling feculent pus present, and an ulcer a half centimetre in diameter was found in the ileum opposite the mesenteric border. The intestine was resected, a wedge-shaped piece including ulcer being removed and sutured; irrigation with boiled water, and abdomen thoroughly cleaned; gauze drainage. Time of operation about one hour. Patient recovered well from operation. Temperature remained about 38° to 38½° C.; pulse 80 to 90. As the gauze did not seem to drain well, on the tenth day a counteropening was made in the loin and gauze drain inserted. Patient made a good recovery.

Examination of the part resected showed absence of tubercle bacilli, and epithelial or connective tissue elements, and an abundance of lymphoid tissue, and round-cell infiltration, so that in the absence of evidences of pressure slough, diagnosis of typhoid ulcer was made.

FERRARESI (*loc. cit.*, see p. 71), also mentions two cases operated on by,—

CANOLI, at the hospital S. Spirito, in Rome. Both cases were *in extremis* when operated upon. Both died. The autopsy report in each case confirmed the clinical diagnosis of perforating typhoid ulcer.

MONOD, in *Le Bulletin Médical*, Paris, November 22, 1896, reports the following case: He operated upon a young man in whom the perforation had occurred the night before. He says, "I performed laparotomy, and found in one of the coils of intestine a perforation from which much liquid fæces exuded. The peritoneal cavity was filled with pus, and a peritonitis was present. In spite of the suture of the perforation and the lavage of the peritoneum, the patient succumbed on the following day. At the autopsy another perforation was found."

CHOLZOW: *Annalen der Russ. Chirurgie*, 1896, Heft 2; abstracted in *Centralblatt für Chirurgie*, 1896, No. 42.—A patient, aged twenty-four years, in the seventh week of typhoid, was seized with severe pain after a bath. Patient had at time double pneumonia.

Operation showed a perforation one centimetre in diameter, twenty centimetres from ileo-cæcal valve. Excision of egg-shaped piece; sutured. Died on the third day.

Three other cases are mentioned as having occurred in the same hospital (names not given), of which one recovered.

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THE RADICAL CURE OF HERNIA, WITH A REPORT OF THREE HUNDRED AND SIXTY CASES.[1]

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IF we glance at the statistics of results of operation for the radical cure of hernia, obtained by leading surgeons six years ago, we can easily understand why the operation failed to win the approval of the profession at large, and why the more conservative surgeons regarded it with doubt or disfavor. As late as 1890, Billroth's statistics, published by Haidenthaller,[2] showed a mortality of 6 per cent., with subsequent relapses in 32 per cent. of 136 cases.

Dr. Bull,[3] writing in 1890, giving his results in 134 cases operated upon during the preceding four years, with three deaths and 38 per cent. of relapses, states:

"In reflecting on the experience of these cases I am obliged to conclude that in these methods, which I have faithfully tried, there is no prospect of attaining a radical cure in any form of hernia, and that the majority of cases will be found to relapse if followed for a sufficient time." Further, in referring to the cases of relapse following various methods of operation, Dr. Bull concludes, "These observations will, without doubt, be duplicated on the cases yet to be traced; and go to strengthen the conviction that all methods of radical cure will be found unsatisfactory."

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[1] Read before the Buffalo Academy of Medicine, Surgical Section, Feb. 2, 1897.

[2] Archiv für klinische Chirurgie, Band 40, S. 494, 1890.

[3] Medical News, July 5, 1890.

Sir William MacCormac, in his Bradshaw lecture of 1893, states that the mortality in cases of non-strangulated hernia, operated upon in four of the leading London hospitals, was 6 per cent.

These examples are sufficient to justify the attitude which conservative medical men have manifested towards all operations for the radical cure of hernia even up to the most recent times.

That this attitude has gradually given way to one of confidence and increasing favor has been largely due to the brilliant work of Bassini, of Padua, whose operation for inguinal hernia has been generally accepted throughout the world as the best yet devised.

In thus giving Bassini the full credit that he deserves we ought not to lose sight of other workers in the same field, who have contributed much towards establishing a firm foundation for the operative treatment of hernia.

Among these workers should be mentioned Championnière, of Paris, Macewen, of Glasgow, and Marcy, Bull and Halsted, in this country.

Bassini's method was a radical departure from the methods then in vogue. He began operating by this method in 1886, and in 1890 published[1] in detail a series of 251 cases with one death and seven relapses, having traced all but four cases to final results. These results were so immensely superior to any that had been hitherto obtained that many were inclined to look upon them with doubt. In spite of the fact that the operation seemed more complicated than others in vogue, the mortality was the lowest recorded, and the percentage of relapses so trifling that the results might be said to be almost perfect.

The operation was soon taken up in this country, Dr. Robert F. Weir, of New York, being among the first to introduce it. There are some operations which, unfortunately, give brilliant results only when performed by the authors themselves, thereby detracting very much from their value to the profession at large. Such is not the history of Bassini's operation.

My own experience with this method dates back to August,

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[1] Archiv für klinische Chirurgie, Band 40, 1890.

1891, and since that time, with few exceptions, I have employed it in all operations for inguinal hernia and with increasing satisfaction.

Statistics of any operation are of little value unless the cases have been traced to final results, a fact especially true of operations for the radical cure of hernia. Therefore I have spent much time and effort in ascertaining the subsequent history of my cases with the result that all but thirty out of 360 cases have been traced.

A brief analysis of these cases as a whole will first be given, and then reference will be made to some points worthy of special note. In a paper read before the New York Surgical Society in January, 1895, and published in the ANNALS OF SURGERY in April, 1895, I gave the results of operation in 200 cases. Since that time I have operated upon 160 cases, making a total of 360 operations with one death, or a mortality of .28 per cent. This death occurred in the first series of cases and was due to double pneumonia, doubtless caused by ether, the child having weak lungs from an attack of measles six weeks previous. The autopsy showed no suppuration in the wound and the abdomen was normal. Hence, if the example of many operators were followed, this death would not be counted.

The 360 operations were divided as follows: for inguinal hernia, 326; femoral hernia, 25; umbilical hernia, 6; ventral hernia, 3; total, 360.

Methods of Operation.—Inguinal hernia: Bassini's method with kangaroo tendon, 300 cases with two relapses; Bassini's, with silk sutures, 1 case with one relapse; suture of the canal without transplantation of the cord, twenty-four cases with three relapses.

Femoral hernia, 25 cases; no relapse; no mortality. Bassini's method for femoral hernia, 10 cases; no relapse. High ligation of the sac with purse-string sutures of canal with kangaroo tendon, 15 cases; no relapse.

Inguinal hernia in the female: fifty-five operations were performed for inguinal hernia in the female with no mortality and no relapse.

Umbilical and ventral hernia: nine cases were operated on, with four relapses. Five of these cases occurred in stout women and four have since relapsed, all within seven months' time of operation, and the fifth has not been traced.

Final Results.—Five cases were perfectly sound upward of five years after operation; two of these having been operated upon by Bassini's method.

Twenty-two cases were sound from four to five years after operation; fourteen of these having been operated upon by Bassini's method, one was a femoral hernia; and in the remainder the method employed was high ligation of the sac with suture of the canal with kangaroo tendon or chromicized catgut, without transplanting the cord.

Twenty-nine cases were sound from three to four years after operation, of which twenty-six were operated on by Bassini's method, one was a femoral, and in the remaining three the canal was sutured as just described.

Sixty-nine cases were sound from two to three years, of which sixty-five were operated on by Bassini's method.

The following tables will show the results in brief.

INGUINAL HERNIA.	METHODS.	
	Bassini's Kangaroo Tendon.	Ligature Sac-Suture Canal.[1]
No recurrence in five years	2	3
“ “ in four to five years	14	8
“ “ in three to four years	26	3
“ “ in two to three years	65	2
“ “ in one to two years	77	4
“ “ in six months to one year	45	2
Cases observed less than six months without recurrence	42	2
Recurred	2	2
Number of cases not traced	20	
Number of cases which after leaving hospital died of other troubles	6	

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[1] The aponeurosis was split and the canal sutured, as in Bassini's operation, but without transplantation of the cord.

Inguinal Hernia in the Female.

No recurrence in three years	1
“ “ in two to three years	5
“ “ in one to two years	20
“ “ in six months to one year	14
“ “ in less than six months	10
Recurred	0
Cases not traced	5
Total	55

Femoral Hernia.[1]

	Male.	Female.
No recurrence in over four years	1	2
“ “ “ three years	0	2
“ “ “ two years	0	2
“ “ “ one year	0	5
“ “ “ six months to one year	2	4
“ “ “ less than six months	0	2
Recurred	0	0
Not traced	2	2
Total	5	19

[1] Six cases were under ten years of age.

Relapsed Hernia.	Period of Relapse.			
	Within Six Months after Operation.	Within One Year after Operation.	Within Two Years after Operation.	Total Number.
Bassini's operation	3	...	...	3
Suture canal without transplanting cord	3	...	1	4[1]
For ventral hernia	3	..	...	3
For umbilical hernia	3	...	...	3

[1] Seven relapses in 350 cases of inguinal and femoral herniæ.

The total number of Bassini's operations is 300, with one death and three relapses. Of these 300 cases 280 have been traced, with the results as shown in the accompanying table. 185 cases operated by Bassini's method were traced beyond one year without relapse.

Of 160 cases of Bassini's method operated upon, more than two years ago, 150 have been traced, with but two relapses.

Wound-Healing.—In my former series of 200 cases, 96 per cent. of inguinal and femoral herniæ healed by primary union.

In the second series of 160 cases, suppuration occurred in but four cases, thus giving 97 per cent. of primary wound-healing. In none of these cases was the suppuration more than slight and superficial, and did not necessitate opening the wound.

Age of Cases operated upon.—Two hundred and fifty cases were under fourteen years of age, the youngest being nineteen months, except three cases operated upon for strangulation, all of which were under one year; 110 were over fourteen years of age. Only eight cases were operated upon under four years of age for non-strangulated hernia. The oldest patient was seventy years of age, and the operation was performed for an irreducible omental hernia.

Of the second series of 160 cases,—

89 occurred in persons under 10 years of age.
49 " " " 10 to 20 " "
17 " " " 20 to 30 " "
6 " " " 30 to 40 " "
1 " " " 40 to 50 " "
1 " " " 70 " "

While some surgeons have been slow in recommending operation for the cure of hernia in children, on the ground that all such cases can be cured by means of trusses, others have hesitated because the operation was believed to be more dangerous in children and less certain in its results. A study of the cases here presented is sufficient to prove neither position well taken.

It is a point of great interest and importance to determine how many persons who have hernia in infancy and childhood remain uncured after having reached adult life.

Other than a few conjectures, I have been able to find no data on this subject, most of the writers on hernia having strangely overlooked it.

To throw some light upon it, I have collected the cases of adult hernia observed in the Hospital for Ruptured and Crippled, during the past four years, that gave a history of having had a hernia in early life, and I have already found upward of 400 such cases. These results will be further elaborated in a subsequent paper; but they are mentioned here to disprove the idea that so commonly prevails that all hernia in childhood can be cured by mechanical treatment. The second objection to extending the operation to children—viz., that it is more dangerous—is refuted by comparing the results obtained in children with those in adults. Adding together the cases of Broca, 477 cases with 2 deaths; Felizet, 105 cases with 1 death; and my own 250 with 1 death, we have 832 with 4 deaths, or a mortality of less than ½ of 1 per cent.

No similar mortality record can be found in a like number of adult cases. The percentage of cures is likewise higher than in adults. In other words, the period of childhood and youth furnishes the most favorable conditions for success in operations for the radical cure of hernia. This fact should not cause us to forget that this same period is likewise the most favorable for nature to effect a cure, either alone or with the aid of a truss.

My 250 cases of hernia in children treated by operation were selected from about 7000 cases of ruptured children under fourteen years of age.

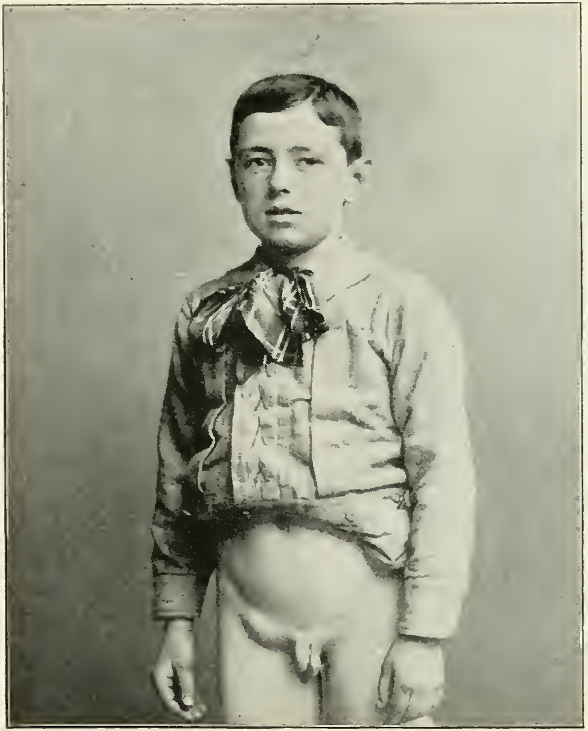
When to operate.—I believe it to be a good rule never to advise the operation in children until a truss has been tried for a reasonable time (*e.g.*, one to two years) without benefit.

There are important exceptions to this rule. In femoral hernia operation can be advised at once, for the reason that the chances of cure by means of a truss are too slight to be considered.

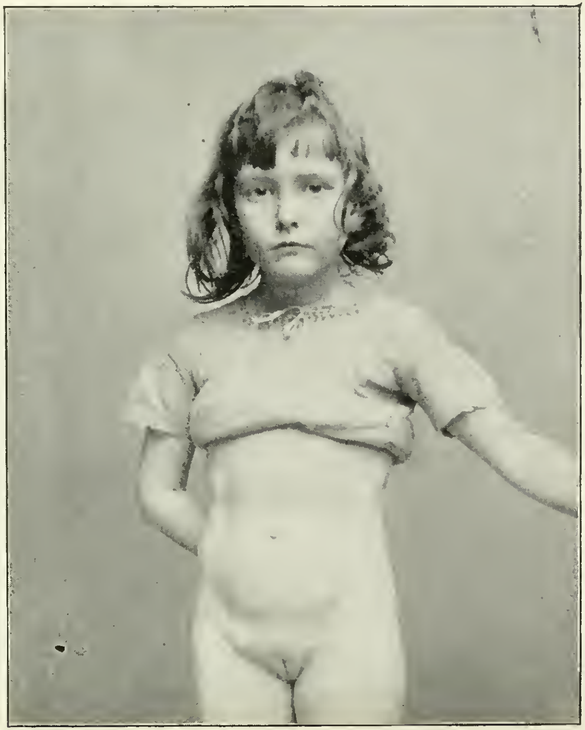
Irreducible or adherent omentum and reducible hydrocele may furnish sufficient reason for early operative interference.

There are, furthermore, a number of cases, especially in dispensary practice, where the rupture cannot be satisfactorily retained on account of insufficient care, and such cases may with profit be subjected to immediate operation.

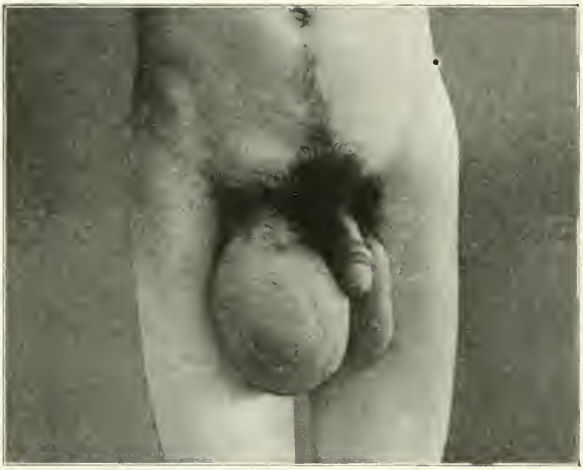
In regard to adults, operation may be advised in most cases of inguinal and femoral hernia up to the age of fifty, unless some contraindications exist.



Femoral hernia in a boy aged eight years. (Coley.)



Femoral hernia in a girl aged seven years. (Coley.)



Inguino-perineal hernia. (Coley.) Operated upon September, 1895.

I would caution against operating on very large irreducible herniæ, especially in stout persons. The operation is a formidable one, on account of the numerous adhesions and the necessity of ligating large masses of omentum, and aside from the danger attending the operation itself, my observation of the final results of operation in such cases has convinced me that few are permanently cured.

Inguinal hernia in women yields practically perfect results, at least when operated upon by Bassini's method.

In fifty-five cases I have had no relapses. I have always dissected off the round ligament from the sac, and sutured the canal in three layers with kangaroo tendon, the entire operation being conducted in exactly the same way as in the male, excepting the transplantation of the cord. The round ligament is allowed to drop back beneath the lowermost layer of sutures.

Femoral Hernia.—Most surgeons have looked upon femoral hernia as less amenable to operative treatment than inguinal.

Bassini[1] published in 1894 fifty-four cases of femoral hernia, operated upon by his own method, with no mortality and no relapses in forty-one cases traced from one to nine years.

The results in my own cases, twenty-five in number, have been thus far perfect, the mortality being *nil*, and no relapses have occurred, my oldest case being now well upward of five years.

It is of interest to note that six of the cases of femoral hernia were under ten years of age. This form of hernia is very rare in childhood.

The methods employed in femoral hernia were two. The first consisting of a high ligation of the sac and closure of the femoral canal by means of a purse-string suture of kangaroo tendon. The second method was Bassini's, which is in brief suture of the canal by two rows of interrupted sutures. This latter method I have employed in ten cases. As the results have been, thus far, perfect from both methods, I hardly know which to prefer. Both are very easy and both make a perfect closure of the femoral canal.

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[1] Archiv für klinische Chirurgie, Band XLVII, 1894.

I think the older operation of simply ligating the sac, making no attempt to close the femoral opening, should be abandoned. Relapse after this method is common.

Rare Forms of Hernia, Cæcal and Appendical.—In fourteen cases the cæcum and appendix, one or both, were found in the hernial sac. In six the appendix alone was found. In but three of these was the appendix removed. One of these cases was strangulated and the vitality of the appendix was so doubtful it was thought best to remove it. In the other two cases adhesions to the sac were the occasion for excision.

A very rare form of hernia, to which I have given the name *inguino-perineal*, is represented by three cases. This form has been described by Macready,[1] and a number of cases have been observed at the London Truss Society, but I have been unable to find any such cases in which operation has been performed to relieve the condition. The largest of my three cases was about the size of a cocoanut. The scrotum on the side of the hernia is found flat and empty.

The hernia is reduced through the inguinal canal. On standing it passes along-side and beneath the scrotum until it occupies the perineal region.

In every case the testis was found in the perineum, at the bottom of the sac, and the maldescent of the testis is undoubtedly responsible for this peculiar form of hernia.

All of the cases occurred in young adults. In one case the testis was removed, and in another it was dissected out from the perineum, and transplanted into the scrotum. This was accomplished without injuring the tunica vaginalis. The results in these cases have been perfect.

Technique of Bassini's Operation.—The technique of the operation is now so well understood that it is unnecessary for me to go over the several steps. There are a few points, however, to which I would like to call especial attention, as I believe them to be of importance:

First, the substitution of kangaroo tendon for silk (used by Bassini), which I have adopted for all buried sutures, I consider

[1] Dennis's System of Surgery, Vol. IV.

a distinct advantage. A year or more ago I published sixteen cases in which I had observed very slow healing and troublesome sinuses, due to non-absorbable sutures, silk, silkworm-gut, and silver wire. Since then I have seen four others. Many of these sinuses developed upwards of a year after the operation and in wounds that had healed by primary union. More than this, the long-continued suppuration so weakened the canal that relapse occurred in nearly all of the cases. These cases, I think, furnish sufficient reason for abandoning all non-absorbable sutures.

In most cases an extra suture should be placed above the cord, the cord passing between the two upper sutures. The operation is often imperfectly done owing to neglect on the part of the surgeon to dissect back the aponeurosis of the external oblique sufficiently, especially on the inner side. I always use interrupted sutures for the deeper layer, and unite the aponeurosis with a continuous suture of kangaroo tendon. The skin is closed with fine catgut that is found absorbed by the first dressing, which is usually made at the end of a week or ten days. Iodoform gauze and moist bichloride gauze held in place by a firmly applied spica bandage has been the dressing uniformly applied in all of my cases.

In children this dressing has been reinforced by a plaster-of-Paris spica extending from the ribs to the knee. The patients are kept in bed for two to two and a half weeks, and allowed to leave the hospital at the end of two and a half to three weeks. In but two or three instances has a truss been advised after operation, the patient having no support of any kind.

Choice of Operation in Inguinal Hernia.—Inasmuch as nearly all of my cases were operated upon by Bassini's method (with the substitution of kangaroo tendon for silk in the buried sutures), I cannot speak from personal experience of other methods ; yet I believe Bassini's method, from a practical as well as a theoretical stand-point, superior *to all* other methods, and this view is confirmed by a comparison of the results of the several operations.

My reasons for preferring it to Halsted's operation have already been given in a former paper (*loc. cit.*), and it is unnecessary to repeat them here.

Halsted, in his last communication upon this subject,[1] stated that he had observed atrophy of the testes in three cases operated upon by his own method.

This condition has never occurred in my cases operated upon by Bassini's method; nor was it observed by Bassini himself.

Transplantation of the cord, the distinctive feature of both the Bassini and Halsted operation, is not yet admitted by all surgeons as essential to the perfect operation for radical cure. During the past four years Dr. Bull and I have been operating upon a series of cases in the same way as Bassini's method with the exception of the transplantation of the cord. This series is yet too small to justify conclusions.

In 1895, in a paper read before the American Surgical Society, Dr. John H. Packard, of Philadelphia, made a somewhat elaborate attempt to prove incorrect the generally-accepted mode of origin of oblique inguinal hernia. His position, as briefly stated in his own language, is as follows: "My conviction is that the hernial sac does not usually occupy the inguinal canal at all, but that in a large proportion of cases at least an oblique inguinal hernia is really ventral, only making its way out at the internal ring, and therefore seems to pass through the canal." In other words, he tries to show that the hernial sac bears no such intimate relation to the cord that all anatomists and surgeons have accorded it.

I have not been able to dissect any cases of hernia in the cadaver, but I have had a chance to study the relation of the sac to the cord in 271 cases of inguinal hernia. In all of these cases, with two exceptions, the sac has been found in most intimate contact with the cord, and this has been true in the acquired as well as the congenital form, in adults as well as in children. If the dissection is done with any care, a distinct layer of fascia, the infundibuliform, is found enclosing both the sac and the cord, the cord itself resting in absolute contact with the sac. The two cases where this condition did not obtain were both direct herniæ, which I admit, as Dr. Packard suggests, are really ventral herniæ.

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[1] Transactions of the American Surgical Society, 1895.

This form of hernia is much rarer than is generally supposed. In these cases the cord was anterior to the sac and outside of the layer of fascia referred to. Another point of some weight in favor of the correctness of the older theory may be found in my three cases of inguino-perineal hernia. If the hernia develops without reference to the cord and as a ventral hernia, why did it not take the usual course instead of following the cord into the perineum?

A careful review of the evidence will, I think, convince one that the cord does play an important part in the formation of oblique inguinal hernia, and, therefore, the operations of Bassini and Halsted still have a rational foundation.

If Dr. Packard's idea is correct, he reasons that it has an important bearing upon the method of operation for the radical cure of hernia, inasmuch as it takes away the anatomical and logical support upon which the transplanting of the cord has been supposed to rest.

Detailed Report of Hernia Cases.

No. 201.—J. Q., male, aged four years. Right inguinal hernia, which had existed since infancy; very large and complicated with a reducible hydrocele. Operation February 6, 1895. Bassini's method; kangaroo tendon; no drainage; wound healing; slight orchitis; primary union. Subsequent history, perfect, January 14, 1897.

No. 202.—P. M., male, aged twenty years. Left oblique inguinal hernia of six months' duration. Operation February 25, 1895. Bassini's method; kangaroo tendon; no drainage; perfect primary union. Final result, January 1, 1897, perfectly sound.

No. 203.—D. F., male, aged six years. Right oblique inguinal hernia, congenital, the size of a child's fist. Operation March 1, 1895. Bassini's method; kangaroo tendon for the buried sutures; no drainage. The wound healed by primary union. Perfect, November 26, 1896.

No. 204.—H. K., male, aged thirteen years. Right oblique inguinal hernia of one year's duration. Had worn truss without benefit. Operation March 1, 1895. Bassini's method; kangaroo tendon; no drainage; primary union followed. Final result not traced.

No. 205.—E. L., male, aged ten years. Right oblique inguinal hernia had existed since birth. Truss had been worn since the patient was one month old, but without benefit. Operation March 29, 1895. Bassini's method; kangaroo tendon; no drainage; hernia was not congenital; sac was very large; primary union. Final result, perfectly sound. No relapse, December 31, 1896.

No. 206.—P. J. M., male, aged twenty-eight years. Left oblique inguinal hernia, *properitoneal.* Had a tumor in left inguinal region and upper scrotum for several years, which was not reducible. Left testis had not fully descended. The hernia was the size of a fist, occupying the left inguinal region and extending up beyond the internal ring. Operation April 4, 1895, at the Post-Graduate Hospital. A large mass of omentum was ligated with catgut and resected; wound was closed with kangaroo tendon by Bassini's method; perfect primary union. Final result, December 1, 1896, perfect.

No. 207.—J. R., female, aged two years and nine months. Right oblique inguinal hernia, which had existed for one year and three months. Patient was treated at the Hospital for Ruptured and Crippled for one year, but no improvement resulted. Operation April 11, 1895, at the Post-Graduate Hospital. Bassini's method; kangaroo tendon; perfect primary union. Final result, perfect, March 12, 1896.

No. 208.—H. K., male, aged eleven years. Right oblique inguinal hernia, which had existed since the boy was three months old. Had worn truss since he was six months of age. Operation April 27, 1895. Bassini's method; kangaroo tendon for the buried sutures, catgut for the skin; perfect primary union followed. Final result, no relapse, January 2, 1897.

No. 209.—M. K., female, aged six years. Left oblique inguinal hernia, which had developed during infancy. She wore a truss for two years and was apparently cured. Relapse occurred one year ago, since which time she has worn a truss without improvement Operation May 3, 1895. Bassini's method; kangaroo tendon for the buried sutures, catgut for the skin; no drainage; primary union. Final result, February 6, 1896, perfectly sound.

No. 210.—A. B., male, aged eight and a half years. Right oblique inguinal hernia. Operation May 10, 1895. The incision was made and wound sutured in three layers exactly as in Bassini's method, except that the cord was not transplanted; sac was very large; ring admitted two fingers; kangaroo tendon. Hernia was found to be acquired. Final result, November 5, 1896, perfectly sound.

No. 211.—W. H., male, aged nine years. Right oblique inguinal hernia, congenital, the size of an orange, probably cæcal. Operation May 10, 1895. The incision was made and wound sutured in three layers exactly as in Bassini's method, except that the cord was not transplanted; kangaroo tendon for the buried sutures and catgut for the skin; primary union. Final result, November 17, 1896, perfectly sound.

No. 212.—W. S., male, aged four years. Right oblique inguinal hernia, congenital. Had been under treatment at Hospital for Ruptured and Crippled for three years without improvement. Operation May 17, 1895. Bassini's method; kangaroo tendon; primary union. November 27, 1895, perfectly sound.

No. 213.—E. G., male, aged thirteen years. Right oblique inguinal hernia, which was acquired in infancy. Patient was operated upon about two years ago at the New York Hospital, but the hernia recurred shortly afterwards. Operation May 31, 1895. Kangaroo tendon for the buried sutures, catgut for the skin; cord was not transplanted, but the wound was closed in three layers, as in Bassini's method; no drainage; primary union. Final result not traced.

Nos. 214 and 215.—M. K., male, aged nine years. Double oblique inguinal hernia, which had existed on the right side since infancy; on the left side since the boy was twenty months old. Patient had been treated at the Hospital for Ruptured and Crippled since 1888, with truss, no improvement resulting. Operation July 12, 1895. Bassini's method for right side; kangaroo tendon for the deep sutures, silkworm-gut for the superficial ones; on left side cord was not transplanted; sutures same as on right side. Both operations were performed at the same time. Perfect primary union on both sides. Final result, October 2, 1896, perfectly sound.

Nos. 216 and 217.—J. H., male, aged seven years. Double oblique inguinal hernia. Was operated upon October 9, 1894, for right inguinal hernia. In April, 1895, he had a very severe whooping-cough, which caused slight recurrence on right side, and also a fresh hernia on left or previously sound side. Operation July 19, 1895. Left side: Bassini's method; kangaroo tendon for the buried sutures and catgut for the skin. Right side: Incision as in Bassini's method; cord and testis normal; aponeurosis thoroughly united;

cord but slightly adherent to aponeurosis; recurrence consisted only of a very slight enlargement of the opening left for the cord above internal ring; no sac found and no opening had been forced through the aponeurosis, nor had the hernia made any progress towards the scrotum. August 18, 1895. On getting up the hernia appears in canal as before operation. Careful examination shows that the hernia does not come through external ring, but through a rent in Poupart's ligament. Final result, January 15, 1897, right side hernia large and not held by truss; left side perfect. Right side reöperated upon January 15, 1897. (By Dr. Bull.)

No. 218.—S. W., male, aged twelve years. Right oblique inguinal hernia, which had existed since infancy, and could not be controlled by a truss which the patient had worn for twelve years. Operation July 19, 1895. Bassini's method; kangaroo tendon for the deep and catgut for the superficial skin sutures; no drainage; primary union. November 2, 1896, perfectly sound.

No. 219.—P. L., male, aged fourteen years. Right oblique inguinal hernia, which had existed since infancy. Hernia was the size of a goose-egg, and could not be controlled by truss; had been treated for two years without improvement. Operation July 26, 1895. Bassini's method; usual technique; kangaroo tendon; hernia proved to be congenital; primary union. November 4, 1896, perfectly sound.

No. 220.—M. B., male, aged five years. Right oblique inguinal hernia of two years' duration; it was very large and could not be held by a truss. Operation August 2, 1895. Bassini's method; kangaroo tendon; primary union. Final result, December 27, 1896, perfectly sound.

No. 221.—J. G., male, aged four years. Right oblique inguinal hernia, which had existed since the patient was three months old. It was the size of a goose-egg, and could not be controlled by truss. Operation August 2, 1895. Bassini's method; kangaroo tendon; wound healed by primary union. September 6, 1895, perfectly sound.

No. 222.—B. V. V., male, aged six and a half years. Right oblique inguinal hernia, complicated with spinal disease. Patient had been operated upon for hernia on left side by Dr. Bull on July 5, 1895. Operation for right side August 2, 1895. Bassini's method; usual technique; primary union followed. Patient died of diphtheria on November 16, 1895, at which time there had been no relapse.

No. 223.—A. K., male, aged four and a half years. Right oblique inguinal hernia which had existed for three and a half years; it was very large and could not be controlled by a truss. Operation August 9, 1895. Bassini's method; usual technique; kangaroo tendon; no drainage; primary union followed. Final result, well, December 3, 1895.

No. 224.—L. S., male, aged six years. Right femoral hernia of a few weeks' duration, the size of an English walnut. Operation August 9, 1895. The sac was ligated high up and the purse-string suture of kangaroo tendon was used in closing the crural canal; perfect primary union followed. Patient left the hospital on September 5, 1895, November 26, 1895, perfectly sound.

No. 225.—W. G., male, aged nine years. Left oblique inguinal hernia of five years' duration, complicated with a reducible hydrocele. Operation August 16, 1895. Bassini's method; usual technique; kangaroo tendon; no drainage; primary union. Final result, November 5, 1896, perfectly sound.

No. 226.—J. S., female, aged four years and nine months. Left femoral hernia, irreducible, size English walnut, which had developed two years ago, following whooping-cough. Patient has a sister with right inguinal hernia. Operation August 16, 1895. High ligation sac with purse-string suture of canal with kangaroo suture; primary union. Final result, perfect, November 5, 1896.

No. 227.—J. C., male, aged six years. Hernia of vermiform appendix; right inguinal of two years' duration. Operation August 23, 1895. Bassini's method. Vermiform appendix, five inches long, without any of bowel found in sac; mesentery of appendix adherent to upper part of sac; sac ligated high up; appendix reduced; primary union. Discharged September 19, 1895. January 24, 1897, perfectly sound.

No. 228.—J. W., male, aged twelve years. Right oblique inguinal hernia, congenital as was shown by operation; very large sac admitted two fingers. Operation September 3, 1895. Bassini's method; kangaroo tendon; sac was very thin and friable; it was ligated with catgut and lower end closed by purse-string suture; stitch-hole abscess. Patient left hospital at the end of five weeks. January 14, 1897, perfectly sound.

No. 229.—L. M., male, aged twelve years and nine months. Right oblique inguinal hernia which had existed since infancy, but was not congenital as shown by operation; hernia was the size of an orange. Operation September 3, 1895. Bassini's method; very large sac; dressed on September 8; primary union followed. Discharged October 3. Final result, January 7, 1897, perfectly sound.

No. 230.—E. McM., male, aged seven years. Right oblique inguinal hernia of five years' duration; the hernia was the size of a small orange; scrotal; congenital. Operation September 13, 1895. Bassini's method; sac very large and thin; lower part of sac was sutured over testis, a purse-string suture of kangaroo tendon being used; primary union. Final result not traced.

No. 231.—L. C., male, aged seven years. Left oblique inguinal hernia. The hernia was the size of a goose-egg and congenital, with a well-developed vermiform appendix in the sac. Operation September 13, 1895. Bassini's method; kangaroo tendon for the buried sutures and catgut for the skin; no drainage. The appendix, four and a half inches long, was found in sac, not adherent; same was not removed; primary union. Discharged from hospital October 3, 1895. Final result, perfect, January 7, 1897. (This is the only case of left-sided hernia in which the sac contained the appendix.)

No. 232.—L. S., female, aged sixteen years. Left inguinal hernia with hydrocele of the canal of Nuck. Patient had a tumor in the left inguinal region of two months' duration, which had never been reducible into the abdominal cavity. Tumor was about the size of an English walnut. Operation September 15, 1895, at the Post-Graduate Hospital. Tumor consisted of perineal sac filled with fluid; sac was patent up to the internal ring, but did not connect with the abdominal cavity. The sac was removed and the canal closed by Bassini's method; kangaroo tendon used for the buried sutures; perfect primary union. Final result, July 1, 1896, perfect.

No. 233.—B. G., female, aged eight years. Left oblique inguinal hernia of several years' duration. Operation September 9, 1895, at the Post-Graduate Hospital. Bassini's method; kangaroo tendon; no drainage; primary union. Patient was in hospital for two and a half weeks. Final result, July 5, 1896, perfect.

No. 234.—J. M., male, aged twenty-seven years. Inguinal perineal hernia on right side, congenital, the size of a large cocoanut, occupying a pouch made up of the skin of the thigh and perineum. Scrotum on this side was entirely empty and flat. Testis was found at the bottom of the hernial sac and was about one-half the normal size. Operation at the Post-Graduate Hospital on September 19, 1895. The hernia was entirely reducible. The atrophied testis was removed and the sac sutured beyond the neck. The superfluous skin was removed. The wound was closed by the Bassini method; kangaroo tendon being used for the buried sutures. Slight iodoform drain was left for two to three days in the perineal end of the wound. The wound healed by perfect primary union. Final result, reported sound and well, January 1, 1897.

No. 235.—P. M., male, aged eight years. Right oblique inguinal hernia of five years' duration. The hernia could not be held by a truss. Operation September 20, 1895. Bassini's method; kangaroo tendon; considerable fluid was found in sac; wound healed by primary union. Final result, perfectly sound, July 17, 1896.

No. 236.—A. L., male, aged seven years. Right oblique inguinal hernia since infancy. Operation September 20, 1895. Bassini's method; kangaroo tendon; no drainage; primary union followed. Subsequent history, perfect, November 4, 1896.

No. 237.—F. E., male, aged two years. Double congenital inguinal hernia, very large; not controlled by truss. Operation September 26, 1895; right side only. Bassini's operation; kangaroo tendon; no drainage; perfect primary union. Final result not traced.

No. 238.—A. B., female, aged seventeen years. Right inguinal hernia of one year's duration; no truss had been worn. Operation September 26, 1895, at the Post-Graduate Hospital. Bassini's operation; kangaroo tendon; no drainage; wound healed by perfect primary union. Final result, well, July 1, 1896.

No. 239.—T. V., male, aged six years. Right inguinal hernia of six years' duration. Operation at the Post-Graduate Hospital, October 1, 1895. Bassini's operation; kangaroo tendon; no drainage; primary union. Final result, perfect, December 5, 1896.

Nos. 240 and 241.—E. R., male, aged eighteen years. Double oblique inguinal hernia which had existed for two years; truss had been worn for ten months without improvement. Operation October 3, 1895. Bassini's method for both sides; kangaroo tendon; no drainage; perfect primary union followed. Perfectly sound August 1, 1896.

No. 242.—J. S., female, aged ten years. Right oblique inguinal hernia of five years' standing. The hernia had been constantly under treatment without improvement. Operation October 4, 1895. Bassini's method; kangaroo tendon; no drainage; wound healed by primary union. Final result, November 4, 1896, perfectly sound.

No. 243.—F. H., male, aged thirteen and a half years. Left oblique inguinal hernia; congenital. The patient had been operated upon on February 15, 1892. Czerny's method; chromicized catgut. Patient had remained well until about a month ago, when a slight recurrence in canal was noticed. Operation October 4, 1895. Bassini's method; kangaroo tendon; no drainage; wound healing, complicated with stitch-hole abscess. Final result, November 3, 1896, perfectly sound, cord and testis normal.

No. 244.—M. K., male, aged six years. Right oblique inguinal hernia of four years' duration. Patient had worn truss constantly without benefit. Operation October 4, 1895. Bassini's method; kangaroo tendon; no drainage; very large sac. Final result, November 16, 1896, perfectly sound.

No. 245.—R. C., male, aged eight years. Right oblique inguinal hernia of six years' duration. Operation October 4, 1895. Bassini's method; kangaroo tendon; primary union. Final result perfect, January, 1897.

No. 246.—G. N., male, aged seven years. Right oblique inguinal hernia of four years' duration. Operation October 10, 1895, at the Post-Graduate Hospital. Bassini's method; kangaroo tendon; perfect primary union. Final result, September 22, 1896, perfectly sound.

No. 247.—E. F., male, aged thirteen years. Right oblique inguinal hernia. The hernia had existed for two years, was very large and great difficulty was experienced in controlling it by truss. Operation October 11, 1895. Bassini's method; kangaroo tendon; hernia proved to be acquired, not congenital; wound healed by primary union. Final result, December 1, 1896, perfectly sound.

No. 248.—J. O'B., male, aged twelve years. Patient had been admitted to hospital on September 6, 1893, for tubercular disease of hip; he also had a left oblique inguinal hernia. Operation October 11, 1895. Bassini's method. The sac was very large, and the hernia was found to be congenital; lower end of sac sutured over testis; primary union followed. Final result, perfect, January 14, 1897.

No. 249.—E. H., female, aged thirty years. Left oblique inguinal hernia of eight months' duration; hernia extended into labium and was the size of an orange. Operation October 15, 1895. Bassini's method ; kangaroo tendon ; no drainage ; perfect primary union. Final result, perfect, August 1, 1896.

No. 250.—A. W., male, aged thirty-four years. Right inguinal hernia. The hernia had appeared a few weeks ago, immediately after a direct injury to the inguinal region (blow) ; it was the size of a fist and irreducible. Operation October 17, 1895, at the Post-Graduate Hospital. Bassini's operation ; kangaroo tendon. A large mass of irreducible omentum was removed ; catgut ligatures ; perfect primary union. Final result, perfect, December 7, 1896.

No. 251.—L. S., male, aged nine years. Left oblique inguinal hernia of five years' duration. Operation October 18, 1895. Bassini's method ; kangaroo tendon. The hernia proved to be congenital ; anæsthetic, ether and oxygen ; primary union. Final result not traced.

No. 252.—C. B., female, aged twelve years. Left oblique inguinal hernia of five years' duration. Operation October 18, 1895. Bassini's method ; kangaroo tendon ; no drainage ; anæsthetic, ether and oxygen ; very satisfactory. Time needed to get patient fully under the influence of the anæsthetics three minutes ; no blueness ; primary union followed. Final result, January 13, 1897, perfectly sound.

No. 253.—F. T., male, aged four years. Left oblique inguinal hernia, not congenital. The hernia was very large and could not be held by a truss. Operation October 18, 1895. Anæsthetic, ether and oxygen ; Bassini's method ; kangaroo tendon ; no drainage. There was slight suppuration ; the wound opened up somewhat, but the suppuration was only superficial. Final result, November 30, 1896, perfectly sound.

Nos. 254 and 255.—C. R., female, aged fourteen years. Double femoral hernia. The hernia had existed since infancy, and was the size of a small egg on both sides. Operation October 25, 1895. High ligation of sac ; purse-string suture of kangaroo tendon was used ; left side additional interrupted sutures of kangaroo tendon in fascia. Final result perfect, January 27, 1897.

No. 256.—E. L., male, aged nine years. Right inguinal hernia of six years' duration ; patient had worn truss since three years without benefit. Operation October 25, 1895. Bassini's method ; kangaroo tendon ; wound healed by primary union. January 20, 1896, perfectly sound. (Slight keloid noticed on lower end of scar.)

No. 257.—A. W., female, aged five years. Right oblique inguinal hernia; had worn truss since she was seven days old, and was treated for about three and a half years at the Hospital for Ruptured and Crippled without improvement. Operation October 31, 1895, at the Post-Graduate Hospital. Bassini's method; kangaroo tendon; perfect primary union. Patient left the hospital after two weeks and four days. Final result, March 26, 1896, perfectly sound; has since developed a hernia on the opposite side.

No. 258.—D. L., male, aged fourteen years. Very large right inguinal hernia; cæcal; congenital; truss had been worn without benefit. Operation November 6, 1895. Bassini's method; cæcum posteriorly was not invested with peritoneum. Much difficulty was experienced in dissecting and ligating the sac; kangaroo tendon; no drainage; perfect primary union. Patient left hospital after two and a half weeks. Subsequent history, perfect, November 1, 1896.

No. 259.—W. N., male, aged seventeen years. Right oblique inguinal hernia which had existed for two years. The hernia was the size of an orange, scrotal, and complicated with hip-disease. Operation November 7, 1895, at the Post-Graduate Hospital. Bassini's method; kangaroo tendon; no drainage; perfect primary union. Left hospital after two weeks and two days. Final result, well, December 1, 1896.

No. 260.—W. H. K., male, aged seven years. Right oblique inguinal hernia, complicated with reducible hydrocele; swelling of right scrotum had been noticed for two years. Operation November 8, 1895. Bassini's method; kangaroo tendon; wound healed by primary union. Subsequent history, November 20, 1896, perfectly sound.

No. 261.—M. F., female, aged twenty-two years. Right oblique inguinal hernia. The hernia was the size of an egg and had existed for five years; no truss had been worn. Operation November 15, 1895. Bassini's method; kangaroo tendon; primary union followed. Final result, perfect, July, 1896.

No. 262.—M. H., male, aged five years. Left oblique inguinal hernia, complicated with spinal disease. Operation November 15, 1895. Bassini's method; kangaroo tendon for the buried sutures and catgut for the skin; no drainage; wound healed by primary union. October 16, 1896, perfectly sound.

No. 263.—J. H., male, aged ten years. Left oblique inguinal hernia of one year's duration. The hernia was acquired, not congenital. Operation November 29, 1895. Bassini's method; kangaroo tendon; wound healed by primary union. Final result, well, January 6, 1896.

No. 264.—F. C., male, aged four years. Right oblique inguinal hernia, not congenital. The hernia was of eleven months' duration and could not be controlled by truss. Operation November 29, 1895. Bassini's method; kangaroo tendon; omentum adherent; constriction of sac; adhesions were cut and ligated. Final result, November 6, 1896, perfectly sound.

No. 265.—W. B., male, aged four and a half years. Right oblique inguinal hernia which had existed since infancy; patient was in good health; truss applied in infancy was worn for seven months when the hernia was apparently cured; a relapse occurred a few days later, and it is now the size of a goose-egg. Operation December 6, 1895. Bassini's method; kangaroo tendon; no drainage; cord was not perfectly transplanted. Final result, perfect, November 4, 1896.

No. 266.—A. R., female, aged sixteen years. Right oblique inguinal hernia which had existed since infancy; truss had been worn for two years. Operation December 6, 1895. Bassini's method; kangaroo tendon; no drainage; wound healed by perfect primary union, and patient left hospital after two weeks. Subsequent history, perfect, January 15, 1897.

No. 267.—T. B., male, aged twenty-four years. Left oblique inguinal hernia of two years' duration; patient had worn truss for six months without benefit. Operation December 12, 1895. Bassini's method; kangaroo tendon; no drainage; perfect primary union followed. Final result not traced.

No. 268.—D. L., male, aged twenty-four years. Right oblique inguinal hernia. Five years ago the patient felt a dull pain in the right groin, and four to five months later he noticed a lump; the hernia was irreducible. Operation December 19, 1895. Bassini's method; kangaroo tendon; no drainage; a large mass of irreducible omentum was ligated with catgut, the canal closed with kangaroo tendon; wound healed by primary union. Final result, January 15, 1896, perfectly sound.

No. 269.—W. M., male, aged ten years. Right oblique inguinal hernia, congenital. The hernia had appeared two years ago and was the size of a goose-egg; it could not be held by a truss. Operation December 28, 1895. Bassini's method; kangaroo tendon; the omentum was adherent and was ligated with catgut; no drainage; primary union. December 1, 1896, perfectly sound.

No. 270.—F. K., female, aged nine years. Right oblique inguinal hernia of eighteen months' duration. Operation January 2, 1897. Bassini's method; kangaroo tendon; no drainage; plaster splint; wound healed by perfect primary union. Final result not traced.

No. 271.—M. H., female, aged twenty-five years. Left femoral hernia of six months' duration; had been irreducible since a short time. Operation January 9, 1896. Bassini's method; kangaroo tendon; the omentum was adherent to sac and ligation was difficult; no drainage; perfect primary union followed. Final result, perfect, October 15, 1896.

No. 272.—M. G., female, aged twenty-one years. Left oblique inguinal hernia which had existed since infancy. The hernia had been treated for two to three years at the Hospital for Ruptured and Crippled and was pronounced cured. It relapsed, however, one year ago, and was the size of an egg. Operation January 16, 1896. Bassini's method; kangaroo tendon. Final result, perfect, July 1, 1896.

No. 273.—W. S., male, aged four years. Left oblique inguinal hernia, not congenital. Truss had been worn for two to three years without improvement. Operation January 24, 1896. Bassini's method; kangaroo tendon; no drainage; primary union followed. Final result, not traced.

No. 274.—N. B., female, aged twenty-eight years. Right oblique inguinal hernia of two years' duration, the size of a goose-egg. Truss had been worn for two years. Operation January 28, 1896. Bassini's method; perfect primary union followed. Final result, perfect, October 31, 1896.

No. 275.—C. G., male, aged two years. Right oblique inguinal hernia which had developed when the child was three months old. The hernia was very large and had been treated the entire time at the Hospital for Ruptured and Crippled. Operation January 31, 1896, at the Post-Graduate Hospital. Bassini's method; kangaroo tendon for the deep sutures and catgut for the skin; perfect primary union followed, and patient was allowed to leave hospital after nine days. February 11, 1896, perfect linear cicatrix; no induration; no swelling of testis. Final result not traced.

No. 276.—E. R., male, aged nine years. Left oblique inguinal hernia which had existed since infancy. Truss had been worn for five years without benefit. Operation February 1, 1896. Bassini's method; kangaroo tendon; primary union followed. Final result, perfect, October 3, 1896.

No. 277.—L. C., female, aged eleven years. Right oblique inguinal hernia of three years' duration. Had worn truss for two years without improvement. Operation February 14, 1896, at the Hospital for Ruptured and Crippled. Bassini's method; kangaroo tendon; primary union. Final result, perfect, October 29, 1896.

No. 278.—J. P., male, aged twenty-six years. Right oblique inguinal hernia of five years' duration. Irreducible. The hernia was not wholly reducible and could not be held by truss. Operation February 15, 1896, at the Post-Graduate Hospital. A mass of omentum was firmly adherent to entire fundus of sac. A mass half the size of a hand was ligated with catgut in small sections and excised; perfect primary union followed, and the patient left hospital March 6, 1896. April 17, 1896, perfectly sound.

No. 279.—L. P., male, aged three years. Ventral hernia which had existed since birth. Half an inch above the umbilicus there was an opening admitting a thumb. Patient had been treated at the Hospital for Ruptured and Crippled for two years, but no improvement resulted. Operation March 5, 1896, at the Post-Graduate Hospital. Fascia was dissected well back to the recti muscles and united with kangaroo-tendon continuous suture; catgut for the skin; no drainage was employed. Final result; slight weakening in line of scar was observed four months later; January 15, 1897, condition the same; wears support.

No. 280.—F. M., male, aged twelve years. Right oblique inguinal hernia which had existed since birth. It was reduced with difficulty. No truss had been worn. Operation March 6, 1896. Bassini's method; kangaroo tendon; primary union. Final result, perfectly sound, February 4, 1897.

Nos. 281 and 282.—C. A. B., male, aged ten years. Right femoral and left inguinal hernia, the former of seven months', the latter of nine and a half years' duration. Operation March 13, 1896. Bassini's operation for both herniæ; kangaroo tendon; primary union. Final result not traced.

No. 283.—A. V., female, aged thirty-five years. Right femoral, irreducible hernia of only a few weeks' duration. Hernia was the size of an egg. Operation March 26, 1896. Bassini's method; kangaroo tendon; a mass of the omentum was ligated with catgut; wound-healing complicated with stitch-hole abscess. Patient left hospital after four weeks. Final result, perfect, November 1, 1896.

No. 284.—K. V., female, aged twenty-three years. Right oblique inguinal hernia of three and a half years' duration. Family history negative. The hernia had been caused by lifting, and truss had been worn for two years. Operation March 26, 1896, at the Post-Graduate Hospital. Bassini's method; kangaroo tendon; primary union followed. Subsequent history, perfect, December 1, 1896.

No. 285.—T. W., male, aged ten and a half years. Left oblique inguinal hernia of one year's duration. No improvement was derived from truss; one partially distended testis. Operation March 27, 1896. Bassini's method; kangaroo tendon; no drainage; primary union. Final result, perfect, November 2, 1896.

No. 286.—H. S., male, nineteen years of age. Left inguinal hernia, the size of a hen's egg, and of about six months' duration. The patient was operated upon for an inguinal hernia on the right side, by Dr. Coley, three years ago; he has worn no truss since. Result, perfect. Operation for hernia on the left side, April 2, 1896, at the Post-Graduate Hospital. Bassini's operation; kangaroo tendon; no drainage; primary union. Final result, perfect, August 1, 1896.

No. 287.—L. B., female, aged twenty years. Left irreducible femoral hernia of one year's duration. An irreducible tumor, the size of a goose-egg, occupied the femoral region, extended up over Poupart's ligament, and was apparently cystic. The diagnosis of irreducible femoral omental hernia with cystic effusion was made. Operation April 16, 1896, at the Post-Graduate Hospital. Bassini's method; kangaroo tendon; a mass of omentum, the size of an egg, was found firmly adherent to about the entire neck of sac; there was also present fluid in the sac; the adhesions were separated with difficulty; the omentum ligated, and canal closed with sutures of kangaroo tendon, catgut for the skin; Halsted's subcutaneous sutures for skin; primary union followed. Final result, well, November 1, 1886.

No. 288.—J. D., male, aged seven years. Left oblique inguinal hernia which had existed since infancy. Truss had been worn for three years without benefit. Operation April 17, 1896. Bassini's method; kangaroo tendon; no drainage; primary union. Final result, perfect, June 5, 1896.

No. 289.—*Appendical Hernia.* J. R., male, aged eight years. Right oblique hernia. Appendix in the sac. The hernia had developed four years ago; truss had been worn for two and a half years, but no improvement resulted. Operation April 17, 1896. Bassini's method; kangaroo tendon; appendix was curled on itself and adherent to sac along its dorsal aspect by firm adhesions; appendix was removed, ligated at base, and mucous membrane dissected out; wound healed by primary union. Final result, not traced.

No. 290.—P. D., male, aged nineteen months. Very large double hernia which could not be held by truss. Operation of right side April 23, 1896, Post-Graduate Hospital. Bassini's method; kangaroo tendon; hernia proved to be acquired, not congenital; wound healing; slight orchitis; primary union. Subsequent history, perfect, December 1, 1896.

No. 291.—E. W., male, aged two and a half years. Right oblique inguinal hernia, which could not be held by a truss. Operation April 23, 1896. Bassini's method; kangaroo tendon; no drainage; wound healed by primary union. Subsequent history, perfect, December 8, 1896.

Nos. 292 and 293.—M. S., female, aged eleven years. Double oblique inguinal hernia of ten months' duration. Truss had been worn for five months, but hernia was not held by same. Operation April 24, 1896. Double Bassini's operation same day; kangaroo tendon. Final result, perfect, November 2, 1896.

Nos. 294 and 295.—M. C. A., female, aged twenty-five years. Double oblique inguinal hernia which had developed six months ago. Operation April 30, 1896. Bassini's method used for both sides; kangaroo tendon; round ligament dissected off from sac; wound healing; primary union. Subsequent history, perfect, January 10, 1897.

No. 296.—G. E., male, aged nine years. Right oblique inguinal hernia of several years' duration. Operation May 1, 1896. Bassini's method; kangaroo tendon; primary union. Final result, perfect, November 5, 1896.

No. 297.—D. F., male, aged eight years. Right oblique inguinal hernia which had existed since the boy was six months old. Truss had been worn the entire time without improvement. Operation May 15, 1896, at the Hospital for Ruptured and Crippled. Bassini's method; kangaroo tendon; no drainage; primary union. Final result, perfect, June 28, 1896.

No. 298.—M. M., female, aged twenty-six years. Right oblique inguinal hernia of eight months' standing. Operation May 21, 1896.

Bassini's method; kangaroo tendon; perfect primary union. Final result, perfect, December 1, 1896.

No. 299.—J. G., male, aged thirteen years. Left oblique inguinal hernia of three years' duration; truss had been worn all along without benefit; testis not wholly descended. Operation May 22, 1896, at the Hospital for Ruptured and Crippled. Bassini's method; kangaroo tendon; no drainage; sac was very large; testis was brought into upper scrotum; primary union. Final result, perfect, January 24, 1896.

No. 300.—W. I. B., male, aged four years (colored). Patient had had a double oblique inguinal hernia, but the left hernia was cured by truss; right hernia had existed since birth; truss had been worn without benefit. Operation May 22, 1896, at the Hospital for Ruptured and Crippled. Primary union. Final result, perfect, October 30, 1896.

No. 301.—G. G., male, aged six years. Right oblique inguinal hernia with partly descended testis; had worn truss for one and a half years without improvement. Operation May 22, 1896. Bassini's method; kangaroo tendon; testis was brought outside of the external ring; wound healed by primary union. Final result, perfect, October 3, 1896.

No. 302.—H. N., male, aged five years. Right oblique inguinal hernia complicated with spinal disease; the hernia had existed for one year, and truss was worn without improvement. Operation May 29, 1896, at the Hospital for Ruptured and Crippled. Bassini's method; kangaroo tendon; no drainage; primary union followed. Final result, well, September 25, 1896.

No. 303.—H. S., female, aged seventy years. Right oblique inguinal hernia of twenty years' duration; patient has worn truss, but hernia has been irreducible since six months. Operation June 3, 1896, at the New York Children's Hospital. Bassini's method; two sacs were found, one the size of a goose-egg, extending nearly into the canal, contained thick gelatinous material, no omentum; the second sac was not connected with the first, but with the abdomen; it contained neither bowel nor omentum, but a cluster of cysts, resembling exactly a bunch of white grapes; examination for echinococcus proved negative; wound closed by Bassini's method; kangaroo tendon; no drainage. Perfect, January 2, 1897.

No. 304.—R. G., male, aged eight years. Right oblique inguinal hernia of seven years' duration; truss had been worn without benefit.

Operation June 5, 1896. Bassini's method; kangaroo tendon; wound healed by primary union. Final result, perfect, July 10, 1896.

No. 305.—W. B., male, aged twenty-three years. Left oblique inguinal hernia, reducible; hernia had existed for two to three years; truss had been worn for two years. Operation June 9, 1896, at the Post-Graduate Hospital. Bassini's method; kangaroo tendon; wound healing by primary union. Final result not traced.

No. 306.—M. T., male, aged eleven years. Very large right oblique inguinal hernia of four years' duration; truss had been worn the entire time without improvement. Operation June 12, 1896. Bassini's method; kangaroo tendon; no drainage; primary union followed. Final result, well, December 1, 1896.

No. 307.—A. D., female, aged twelve years. Right oblique inguinal hernia. Operation June 16, 1896. Bassini's method; kangaroo tendon; no drainage; wound healed by primary union. Final result, perfectly sound, December 1, 1896.

No. 308.—M. C., female, aged eleven years. Left oblique inguinal hernia of two years' duration; truss had been worn without improvement. Operation June 16, 1896. Bassini's method; kangaroo tendon; wound healed by primary union. Final result, perfect, September 10, 1896.

No. 309.—T. E., male, aged fifteen years. Left oblique inguinal hernia, which had existed since infancy, and was down occasionally within the last two years; truss had been worn most of the time. Operation June 24, 1896, at the Post-Graduate Hospital. Bassini's method; kangaroo tendon; wound healed by primary union. At the end of ten days two of the catgut sutures gave way, which caused slight separation of wound edges; no pus; patient left the hospital at the end of three weeks and two days. Subsequent history, perfect, December 1, 1896.

No. 310.—A. S., male , aged thirty-five years. Right inguinal perineal hernia of six years' duration. Operation July 7, 1896. Bassini's method; kangaroo tendon; testis was found in pouch in perineum, and not in scrotum at all; testis was not removed

The operation showed the hernia to have been acquired, not congenital; wound was closed according to Bassini's method; primary wound healing. Final result not traced.

No. 311.—J. H., male, aged eleven years. Right oblique inguinal hernia, congenital. The hernia had been cured by truss, but had relapsed. Operation July 10, 1896, at the Hospital for Ruptured and Crippled. Bassini's method; kangaroo tendon; no drainage; primary union. Final result, perfectly sound, September 18, 1896.

No. 312.—J. K., male, aged seven years. Left oblique inguinal hernia, acquired four years ago. Operation July 10, 1896, at the Hospital for Ruptured and Crippled. Bassini's method; kangaroo tendon; primary union. Final result not traced.

No. 313.—J. C., male, aged four years. Right oblique inguinal hernia, very large; had worn truss since two years, but no benefit was derived. Operation July 10, 1896, at the Hospital for Ruptured and Crippled. Bassini's method; kangaroo tendon; no drainage; primary union followed. Final result, perfectly sound, September 24, 1896.

No. 314.—R. R., male, aged eight years. Right femoral hernia of two years' duration. Operation July 14, 1896. Bassini's method. The sac was ligated high up and the canal closed by buried purse-string sutures of kangaroo tendon; no drainage; wound healing; primary union. Final result, well, February, 6, 1897.

No. 315.—O. R., male, aged ten years. Right oblique inguinal hernia of several years' duration; patient had worn truss without improvement. Operation July 14, 1896. Bassini's method; kangaroo tendon; perfect primary union. Final result, well, February 3, 1897.

No. 316.—L. R., female, aged seventeen years. Right oblique inguinal hernia of thirteen years' duration. Operation July 16, 1896, at the Post-Graduate Hospital. Bassini's method; kangaroo tendon; wound healing; primary union. Subsequent history, perfect, November 1, 1896.

No. 317.—W. Y., male, aged nineteen years. Right oblique inguinal hernia, which had developed one year ago; patient had worn truss since nine months. Operation July 16, 1896. Bassini's method; kangaroo tendon; no drainage; wound healed by perfect primary union; patient left hospital at the end of two and a half weeks. Subsequent history, well, October 1, 1896.

No. 318.—A. H., female, aged eighteen years. Right oblique inguinal hernia of three years' standing. Operation July 16, 1896. Bassini's method; kangaroo tendon; no drainage; wound healed by primary union, and patient was dismissed at the end of two weeks. Subsequent history, perfect, January, 8, 1897.

No. 319.—C. B., male, aged eight years. Right oblique inguinal hernia, congenital; large scrotal. Operation July 18, 1896, at the Hospital for Ruptured and Crippled. Bassini's method; kangaroo tendon; primary union. Final result, perfect, October 9, 1896.

No. 320.—J. B., male, aged nine years. Left oblique inguinal hernia, acquired six years ago; truss had been worn. Operation July 18, 1896, at the Hospital for Ruptured and Crippled. Bassini's method; kangaroo tendon; no drainage; primary union. Final result, perfect, January 24, 1897.

No. 321.—H. G., male, aged seven years. Right oblique inguinal hernia of several years' standing. Operation July 24, 1896, at the Post-Graduate Hospital. Bassini's operation; kangaroo tendon; wound healed by primary union, and patient left hospital at the end of two and a half weeks. Final result, perfect, November 15, 1896.

No. 322.—E. C., male, aged eight years. Left oblique inguinal hernia, which had existed for seven years; truss had been worn without benefit. Operation July 24, 1896. Bassini's method; kangaroo tendon; primary union. Final result, perfect, October 29, 1896.

No. 323.—D. M., male, aged nine years. Double oblique inguinal hernia with undescended testis. The herniæ had existed since the boy was three months old; truss had been worn constantly. Operation July 31, 1896. Right side, cord was not transplanted; sac was ligated high up; canal closed in three layers; kangaroo tendon as in Bassini's method; testis was drawn outside of external ring; primary union followed on both sides. Final result, perfect, October 9, 1896.

(Left side operated upon by same method by Dr. Bull same day.)

No. 324,—L. G., female, aged twelve years. Very large right oblique inguinal hernia of but a few weeks' duration. Operation July 31, 1896, at the Hospital for Ruptured and Crippled. Bassini's method; kangaroo tendon; time of operation ten minutes; primary union followed. Final result, perfect, September 4, 1896.

No. 325.—J. C., male, aged five and a half years. Left oblique inguinal hernia, acquired three years ago; truss had been worn without benefit. Operation August 7, 1896, at the Hospital for Ruptured and Crippled. Bassini's method; kangaroo tendon; primary union. Final result, perfect, October 29, 1896.

No. 326.—J. G., female, aged ten years. Left oblique inguinal hernia of several years' duration; truss had been worn for two years without improvement. Operation August 7, 1896, at the Hospital for Ruptured and Crippled. Bassini's method; kangaroo tendon; no drainage. Final result, perfect, January 14, 1897.

No. 327.—S. M., male, aged nine years. Right oblique inguinal hernia, congenital; the size of an egg, not held by truss. Operation August 7, 1896, at the Hospital for Ruptured and Crippled. Bassini's method; kangaroo tendon; no drainage. Final result not traced.

No. 328.—M. W., aged twelve years. Double oblique inguinal hernia, which had existed since birth, but was not congenital, as was shown by operation. Operation August 14, 1896. Bassini's method; right side kangaroo tendon; primary union. Final result, well, September 17, 1896.

No. 329.—A. P., male, aged nine years. Left femoral hernia, irreducible; the size of a walnut. The hernia had developed one week ago. Operation August 21, 1896, at the Hospital for Ruptured and Crippled. Bassini's operation; kangaroo tendon; primary union. Final result, well, January 3, 1897.

No. 330.—*Inguino-Perineal Hernia.*—W. C., male, aged sixteen years. Right inguino-perineal hernia. Family history good. Noticed swelling in right groin but a few days ago. Examination showed a normal-sized testis on the right side in middle of perineum; hernia in canal does not enter perineal region; testis, tender and slightly indurated, shows evidence of recent orchitis. Operation August 27, 1896, at the Post-Graduate Hospital. Bassini's incision; small, thin hernial sac going down nearly to, but not communicating with, enlarged tunica vaginalis, which had some bloody fluid in cavity; testis could be pushed back nearly to rectum; right scrotum was empty and flat; testis and tunica were dissected out from the perineum and put into scrotum in normal position; rent in tunica sutured and testis sutures covered. Canal closed by Bassini's method, with kangaroo tendon; no drainage. Time of operation, fifty minutes. Final result, well, October 1, 1896.

Nos. 331 and 332.—L. H., male, aged eight years. Double oblique inguinal hernia of five years' duration; truss had been worn for four years without improvement. Operation August 28, 1896; both sides. Bassini's method; kangaroo tendon; primary union. Final result, perfect, October 2, 1896.

No. 333.—H. D., male, aged six years. Right oblique inguinal hernia complicated with spinal disease. The hernia had existed for one year and was very large and complicated with reducible hydrocele; not held by truss. Operation August 28, 1896. Bassini's method; kangaroo tendon; no drainage; primary union. Final result, well, January 10, 1897.

Nos. 334 and 335.—J. W. P., male, aged twenty-seven years. Double oblique inguinal hernia of several years' duration; patient had worn truss. Operation September 14, 1896, at the Post-Graduate Hospital. Double Bassini's operation; sac on either side did not extend into scrotum; that on right side was the larger; left side operation done by Dr. Williams, house surgeon; kangaroo tendon used for both sides and catgut for the skin. Final result, perfect, January 2, 1897.

No. 336.—T. M., male, aged ten years. Right oblique inguinal hernia; the hernia had existed since the boy was one and a half years old, but was not congenital, as was shown by the operation. Operation September 22, 1896, at the Hospital for Ruptured and Crippled. Bassini's method; kangaroo tendon; no drainage; primary union. Final result not traced, perfect, November 24, 1896.

No. 337.—J. H., male, aged eleven years. Right oblique inguinal hernia, acquired, not congenital, although it had existed since infancy. Operation September 22, 1896. Bassini's method; kangaroo tendon; primary union, perfect, December 16, 1896.

Nos. 338 and 339.—A. M., female, eleven years of age. Double inguinal hernia, which had existed since the patient was five years old. Operation September 6, 1895; both sides. Bassini's method, usual technique; kangaroo tendon; primary union. Final result, perfect, November 2, 1896.

No. 340.—B. G., male, aged nine years (colored). Right oblique inguinal hernia of two years' duration; truss had been worn for two years without improvement. Operation June 12, 1896, at the Hospital for Ruptured and Crippled. Bassini's method; kangaroo tendon; primary union. Final result, perfect, November 5, 1896.

No. 341.—W. M., male, aged thirteen years. Right oblique inguinal hernia, not held by truss. Operation September 23, 1896, at the Post-Graduate Hospital. Bassini's operation; kangaroo tendon; perfect primary union; three weeks in hospital. Final result, perfect, January 15, 1897.

No. 342.—M. W., male, aged ten years. Left oblique inguinal hernia complicated with large reducible hydrocele. History: one year ago the patient was treated for a left-sided hydrocele by means of carbolic-acid injections; very severe orchitis followed the injection of five minims of carbolic acid; for two to three days temperature ranged between 102° and 104° F. After the orchitis had subsided, the hydrocele was found to be somewhat improved, but never disappeared entirely. Four months ago the hydrocele had increased very much in size, and on pressure could be almost entirely reduced into the abdominal cavity. Examination, November 5, 1895, showed a tumor in the scrotum the size of an orange, apparently entirely filled up with fluid. Pressure and manipulation caused the major portion of the fluid to reduce into the abdominal cavity, but some of it could not be forced back farther than the internal ring. Diagnosis was made of a reducible hydrocele connecting with the abdominal cavity by a valve-like opening near the internal ring. Operation November 5, 1896, at the Post-Graduate Hospital. Bassini's operation was performed, and on opening the canal, the hydrocele sac was found to extend to a point about half-way between internal and external rings, where it was connected with the hernial sac by means of a small opening about the size of a lead-pencil. The sac above and below this opening was very much dilated, so that pressure could easily produce a valve-like closure of the opening. A sufficient portion of the tunica was left to cover the testis, and the remainder of the sac was ligated well above the internal ring, and the wound closed in the usual way with kangaroo tendon. Perfect, January 25, 1897.

No. 343.—E. R., female, aged twenty-five years. Right femoral hernia of four years' duration, with history of having been irreducible for two days with severe abdominal pain, vomiting, and constipation, the hernia was partially reduced by a physician. Operation November 13, 1896, at the Post-Graduate Hospital. The sac was found empty, but showed evidence of recent congestion. The sac was ligated high up and the wound closed with interrupted sutures of kangaroo tendon, by Bassini's method, for femoral hernia. Perfect primary union followed, and patient left hospital at end of two weeks. Well, January 10, 1897.

No. 344.—G. E., male, aged ten years. Right inguinal hernia of two years' duration and not improved by wearing a truss. Operation November 19, 1896, at the Post-Graduate Hospital. Bassini's method; kangaroo tendon; primary union. Well, January 15, 1897.

No. 345.—T. B., male, aged thirty-three years. Right inguinal hernia of four months' duration, caused by heavy lifting. Operation

November 28, 1896, at the Post-Graduate Hospital. Bassini's method; kangaroo tendon; primary union. Well, January 15, 1897.

No. 346.—J. M., male, aged two and a half years. Large right inguinal hernia, which had existed since infancy; could not be controlled by truss. Operation December 3, 1896, at the Post-Graduate Hospital. Bassini's method; kangaroo tendon; no drainage; primary union.

No. 347.—K. B., female, aged seventeen years. Left oblique inguinal hernia, the size of an egg, of about two months' duration. Patient did not like to wear a truss and submitted to an operation for radical cure. The same was performed on December 3, 1896, at the Post-Graduate Hospital. Bassini's operation; kangaroo tendon.

No. 348.—W. T., male, aged six years. Very large right inguinal hernia, the size of an orange, had existed since infancy and could not be controlled by truss. Operation December 5, 1896, Nyack, N. Y. Bassini's method; kangaroo tendon; no drain.

No. 349.—T. F., male, aged thirty-three years. Right inguinal hernia of three and a half months' duration; caused by heavy lifting. Operation November 28, 1896, at the Post-Graduate Hospital. Bassini's operation; kangaroo tendon; no drainage; perfect primary union.

No. 350.—G. R., female, aged seven years. Right femoral hernia of five months' duration. Family history good; hernia was the size of an English walnut. Operation December 10, 1896, at the Post-Graduate Hospital. Bassini's method; kangaroo tendon for the buried sutures; perfect primary union.

No. 351.—M. T., male, aged four years. Right inguinal hernia, caused by a fall two years ago. Truss worn two years without benefit. Operation January 7, 1897, at the Post-Graduate Hospital. Bassini's method; primary union.

Nos. 352 and 353.—M. R., female, aged thirty-six years. Double inguinal hernia following Alexander's operation, which had been performed in March, 1895. The herniæ appeared shortly (few weeks) after leaving the hospital and has caused much pain since. On the right side a portion of the tumor, the size of an English walnut, could not be reduced beyond the canal, and was very painful on pressure. Operation showed this to be a well-developed hydrocele of the canal of Nuck, or, more properly, cyst of the round ligament. It was made up of one large cyst and a number of smaller ones, separated from one another by means of very thin partitions. They were closely connected with the round ligament and were situated in the hernial sac, extending up as far as the internal ring. Both sides were operated upon on the same day, January 7, 1897, at the Post-Graduate Hospital. Bassini's method; usual technique; primary union followed.

Nos. 354 and 355.—D. C., female, aged seven years. Double inguinal hernia which had existed one and a half years on the right side and a few months on the left. A truss had been worn without benefit. Operation January 14, 1897, at the Post-Graduate Hospital; both sides. Bassini's method; kangaroo tendon; primary union.

No. 356.—E. S., female, aged twelve years. Right inguinal hernia of two years' duration. Operation January 15, 1897. Bassini's method; kangaroo tendon.

No. 357.—*Appendical Hernia.*—J. H., male, aged nine years. Right inguinal hernia since infancy. A truss had been worn, but without benefit. Operation January 15, 1897, at the Hospital for Ruptured and Crippled. On opening the sac it was found to contain only the appendix vermiformis, which was very long (four inches) and adherent throughout one-half its length, along its mesenteric border to the wall of the sac. The mesentery extended nearly to the end of the appendix. The mesentery was ligated by means of catgut and cut, thus freeing the appendix to the base, where it was cut off and the stump inverted and buried by catgut sutures. The wound was closed by the usual Bassini method; kangaroo sutures.

No. 358.—R. S., male, aged ten years. Right inguinal hernia. Operation April, 1895, at the Post-Graduate Hospital. Bassini's method; primary union. Perfect, October 1, 1896.

No. 359.—J. S., male, aged nine years. Left inguinal hernia of very large size, which had existed since infancy, and could not be held by a truss. Operation April 7, 1894, at the Post-Graduate Hospital. Bassini's method; primary union. Final result, perfect, January 15, 1897.

No. 360.—W. J., male, 5½ years old. Right inguinal hernia of two years' duration. Operation January 22, 1897, at the Hospital for Ruptured and Cripple. Bassini's method; Kangaroo tendon; primary union.

No. 361.—P., female, aged fifty years. Right femoral hernia, strangulated for eighty-four hours. The hernia had existed for a good many years, but patient had never worn truss; had frequent attacks of incarceration, but always reduced by patient or doctor. Operation September 8, 1896, at the Post-Graduate Hospital. There was a tumor in the right femoral region the size of a small egg. On opening the sac, which was greatly thickened and œdematous, a coil of very dark intestine was seen, very tightly constricted by the falciform portion of crural arch. This loop was about three inches long. On cutting the constriction the bowel did not regain its color; it had lost its glistening appearance and the serous coat was destroyed over a small area. The condition of the patient was fair; pulse 100, temperature 100° F.; and it was thought wise to do a primary resection. Seven and a half inches of the bowel were removed, and end-to-end suture performed by means of a double row of continuous right-angled (Cushing) Lembert's sutures. The placing of these two rows of sutures took twelve minutes. The bowel was then replaced in the abdomen and the wound partially closed, leaving enough room for small gauze drainage. Patient's condition at the end of the operation was very good. Final result: patient did well for three days. then gradually grew weaker. There was no passage from bowels and there was slight distention the fourth day. Temperature and pulse were but little elevated, and there was no suppuration in wound. Her condition gradually failed and she died on the seventh day. A partial autopsy with removal of the sutured portion of bowel showed no leakage had occurred, and there was no evidence of peritonitis.

TERTIARY SYPHILITIC EPIDIDYMITIS.[1]

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FOR a long time tuberculosis and gonorrhœa were the only diseases that were supposed to attack the epididymis, but of late years a certain number of syphilitic manifestations have been proven to occur in this organ, but, as the cases of tertiary syphilitic epididymitis are not of very frequent occurrence, the report of the following case, occurring in the writer's practice, as well as a few remarks regarding the differential diagnosis of this affection, may not be without some interest.

Tertiary syphilitic epididymitis appears from two to twenty years after the primary accident, and appears to attack preferably patients who are in full sexual activity,—that is to say, from thirty-five to forty-five years of age. Now, if sclero-gummous orchitis occasionally occurs as a tertiary symptom, the hereditary tertiary syphilitic epididymitis, on the other hand, appears to be exclusively confined to cases of acquired syphilis.

A certain number of circumstances appear to cause it to occur, and since the time of the illustrious Ricord observers have recognized the influence of venereal excess on the development of genital syphilis. A large number of cases reported in an excellent monograph by Delahaye appear in every way to favor this assertion. Traumatism, gonorrhœa, and primary inflammatory conditions produce a *locus minoris resistentiæ* in the epididymis. In the same way carcinoma has been noticed to follow a syphilitic sarcocele, in the same manner as we notice that in many of the cases of gonococcus infection or traumatism has favored or awakens anew the syphilitic diathesis.

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[1] Read at the Surgical Section of the Suffolk District Medical Society, January 6, 1897.

The case in question was that of a single gentleman, a merchant of some thirty-three years of age, actively engaged in a large business. He was a very well educated man, and took extremely good care of himself in every respect. He called on me one day, saying that for some two weeks past he had noticed a small swelling at the bottom of the left testicle, and that it gave him a feeling of weight and tension in the organ, although no actual pain was present, either spontaneous or when the organ was pressed upon.

Upon examination the scrotum appeared in every way normal; the left testicle, however, appeared decidedly lower than the right. By palpation I discovered a small, round, hard tumor, about the size of a cherry, situated on the head of the epididymis. This tumor was in no way painful when squeezed between the thumb and index-finger; it was spherical and presented a few inequalities over its surface. The scrotum was normal, and no change could be detected in the spermatic cord; prostate normal. The patient was questioned closely regarding any antecedent trouble of venereal origin, but the only thing that was admitted was a gonorrhœa contracted some six or seven years previously, and of which there remained no trace. The patient admitted that he was cohabiting with a woman whose husband had had one of his testicles removed for tuberculosis some years previously. Thinking that I might possibly be in presence of a primary genital tuberculosis, contracted from coitus, I ordered a suspensory bandage and the application night and morning of belladonna ointment, which was used as a palliative treatment, without any hope of curing the disease, and the patient ordered to return in a week.

He did so, and at this time I found the tumefaction slightly increased in size. I then told him that, as he had never had syphilis according to his own statement, I considered the growth, although not characteristic, as one produced by tuberculosis, and advised immediate removal of the testicle, which, by the way, I must here state, was normal in every way. Its characteristic sensibility was present, it was of normal consistency, and, in fact, in every way apparently free from any pathological change.

When told that he must undergo this operation, as well as the loss of this organ, the patient said that he did remember that some five years ago he had had a sore on his penis, and a few weeks later he had a sore throat and a slight eruption over the thorax and back, with loss of hair, all of which symptoms had disappeared and had never returned since. He also stated that he had consulted a physician at that time, and was given mercury in the form of pills, which he took for some three weeks' time and had never taken any since.

I carefully examined the patient from head to foot, and found all the viscera absolutely normal, and the patient's condition in every respect excellent. Blood examination showed hæmoglobin was 98 per cent., and the blood count showed 4,300,000 red blood-corpuscles to the cubic millimetre. The mouth and teeth were in perfect condition, and so, believing that, on account of the very imperfect specific treatment which he had undergone, this was a tertiary manifestation of his syphilitic diathesis, and that it was necessary to act immediately, he was placed on protiodide of mercury, five centigrammes thrice daily, and ten centigrammes of iodol thrice daily. The patient was seen once a week for four weeks, after which time the tumor had become so reduced in size that only a slight induration of the epididymis was noticed.

Since taking the above notes, in February, 1896, the patient has again been submitted during the month of September to the same mixed treatment, and, although no other manifestation of the disease has made its appearance, he has been ordered to return in the spring in order to receive more specific treatment.

Regarding the symptoms of tertiary syphilitic epididymitis, it appears that the affection generally begins in a subacute form, with pains of variable intensity, either spontaneous or produced by pressure. In other cases, as in the one here reported, the pain or feeling of weight only occurs after the patient is tired, and sometimes the feeling of weight and dragging sensation is only present, pain being entirely absent. As in all neoplasms due to tertiary syphilis, the growth may occur without any symptoms whatever, the patient only noticing it after it has attained a certain size, as in one case mentioned, or after the products of the tumor have been evacuated through the skin.

In the beginning the scrotum does not present any trace of inflammation, and the soft parts may be pushed over the tumefaction with ease. The vaginal membrane is occasionally the seat of a liquid collection, and the latter has sometimes been the means of preventing a thorough and complete examination of the epididymis and testicle. If the testicle is palpated, the organ will be found of normal consistency, without any point of induration or any change in size, and its characteristic sensibility will also be found normal. The spermatic cord is also found healthy, although some cases of localized gummata have been reported as occurring in this organ, although in the cases of tertiary epididymitis that have been reported the former do not appear to be present during the evolution of the latter affection.

Let us now consider the syphiloma of the epididymis itself. It may invade the caput or a part of the epididymis, but usually it is diffused, involving the entire organ, in the form of a tumefaction, having a firm and resistant consistency. The tumor is irregular, and in some cases palpation will show several indurated points in the caput, corpus, and tail of the epididymis, or both segments of the organ may be included in a single node. The usual size of these nodes of induration vary from that of a small nut to an English walnut. When the tumor does not invade the entire epididymis, it is sometimes the caput and sometimes the tail which is the seat of the disease, but generally—and Delahaye insists on this fact—the organ is entirely invaded. An important fact to mention is the great distinctness with which the healthy testicle may be isolated from the indurated points in the epididymis, and those adhesions which are found in gonorrhœal epididymo-orchitis are entirely wanting.

The last proper character of this type of epididymitis, and which appears to have a certain clinical value, is that the lesion is always unilateral. In nine cases mentioned by Delahaye the disease was only found in one epididymis, but Allen mentions two cases of bilateral epididymitis occurring eight and ten years after the chancre, but the tertiary state of these patients was not confirmed by any other syphilitic accident present at the same time as the epididymitis.

When the disease under consideration is acute, the patient will immediately seek medical advice, and, if he is found syphilitic, a proper treatment will be applied; but it is not the same thing when the tumor has been present and has slowly and insidiously evoluted. The patient does not notice the affection for the simple reason that he suffers in no way from it, and it is only after a long time from the commencement that a fistula occurs, and the patient will then seek a surgeon.

Some cases reported have demonstrated that these indurations in the epididymis evolute as all tertiary growths, either towards sclerosis or towards gummous degeneration. In one case the patient had had his tumor for six months, and palpation gave a feeling of a softened gumma. The duration of the disease may consequently be quite long, and the mixed treatment followed for a few months will finally reduce the tumor to the size of a small indurated nodule.

The persistence of a sclerosis nodule after disappearance of the syphiloma is, however, a cure, the second manner in which a tertiary epididymitis may end. In other cases an induration may undergo the degenerative evolution of a gumma. The tumor loses its firm consistency and becomes the seat of a pseudo-fluctuation and breaks down. Soon adhesions are formed with the neighboring tissues, the scrotum becomes violet in color and ulcerated, and a fistula appears at the lower part or the back part of the scrotum, from the orifice of which a liquid flows out, which in aspect very much resembles a solution of gum.

To sum up, we may say that the beginning is generally subacute. The induration is irregular, and often the entire epididymis is invaded, although without adhesions to the testicle. There is a tendency to sclerosis or to the formation of gummata. These are the symptoms that I think we may attribute to tertiary syphilitic epididymitis.

Regarding the pathology of tertiary epididymitis, not much can be said, because so far no case of this disease has been examined microscopically. However, it is probable that in an advanced condition it would present the same characters as found in a gumma.

According to Allen, a nodule probably represents small gumma disseminated throughout the organ, which gives to the examining hand the sensation of an irregular body. It may also take on the form of an infiltration or gummatous hyperplasia of a diffused type, and these form large masses, which may be true tumors, and which will finally undergo a sclerous change, and the organ will then be found hard and fibrous.

Regarding the differential diagnosis, tertiary epididymitis will certainly present much difficulty, and it is certainly important, on account of the prognosis and for the treatment, to arrive at a definite conclusion regarding the nature of the affection.

In the first place, secondary epididymitis is in some ways similar to the tertiary form ; the tumor is distinctly isolated from the testicle, the pains are subacute on pressure, and its consistency is firm, and the tumor is lumpy. There are some signs which will permit certainly of a differential diagnosis, because in secondary epididymitis the lesion is limited to the caput of the organ, and out of eighty-six cases collected by Cuilleret, the tumefaction, including the entire organ, was not met with in any case, while in the tertiary type Delahaye found the lesions were diffused in five out of nine cases.

On the other hand, when we are dealing with a secondary epididymitis, both organs are often the seat of the trouble. Dron found the affection on both sides in seven cases out of fourteen; Balme five times out of twenty-two cases ; Telemat, three times out of eight, and Cuilleret, six times out of twelve. In one of the forms of the disease, the commencement is often insidious, while the other is accompanied by acute and painful symptoms. The tertiary syphiloma does not have the induration similar to a pea or pill, and as if set into the caput of the epididymis, which is characteristic in the secondary variety. On the contrary, the indurated nodes are often multiple, much larger than in the secondary form and the entire epididymis or, at least, the two neighboring segments of the organ are involved.

In the therapeutical point of view, there seems also to be a difference between these two types, and, according to Dron, the secondary resists for a long time specific treatment, and especially iodide of potassinm, especially when the latter is given alone; and Mauriac is also of this opinion. It is not less true that the diagnosis is sometimes very delicate, especially when we find ourselves in presence of one of the transitional forms—that is to say, between the secondary and tertiary period,—occurring several years after infection; but in this case the existence or the absence of other tertiary manifestations will settle the question as to the diagnosis.

In gonorrhœal epididymitis, the beginning is subacute, and the division of the lesions characteristic of the tertiary manifestation may sometimes be taken for an epididymitis due to the gonococcus, but the intensity of the pain, the fever, the external signs of inflammation, induration of the epididymis, which is firmly bound to the testicle, the frequency of inflammation of the vaginal membrane, and especially the presence of a discharge from the urethra, will assure the diagnosis in the majority of cases. But, if we are dealing with one of the acute and subacute forms described by Angagneur and mentioned by Delahaye, if the discharge is slight or has disappeared for some time, the problem is far more delicate. And, nevertheless, in cases of latent and chronic gonorrhœa, the induration becomes localized in the tail of the epididymis, and careful palpation will show the presence of adhesions with the testicle, while in tertiary epididymitis the testicle and epididymis are distinctly isolated one from the other. And, lastly, the antecedents of the patient and the history of a former primary sclerosis, the presence of other tertiary symptoms, as well as the result of treatment, will confirm the diagnosis.

Tubercular epididymitis may have an acute or chronic course, and, as in the disease under consideration, the softened contents of the foci break down and are evacuated through the skin of the scrotum, leaving behind one or several fistulæ.

If we are dealing with a case in which the scrotum is healthy, the indurations of a tubercular epididymitis are less well marked and less distinct than in tertiary syphilis. These bosses are often very large, of unequal consistency, and less rounded. Frequently the testicle and the cord are often the seat of disease, and the prostate and the seminal vesicles may also be involved in a tubercular process before the epididymis is attacked. Rectal examination is consequently decidedly indicated, in order to make a diagnosis, and often the examination of the lungs will reveal symptoms of pulmonary tuberculosis.

If all these signs are wanting, the only thing that remains for us to try is the antisyphilitic treatment; iodide of potassium and mercury will never have any action on tuberculosis, while the contrary is true for tertiary lesions.

If we are dealing with a case presenting a fistula, which is present at the lower or posterior aspect of the scrotum, with an indurated epididymis adherent to the neighboring parts, the diagnostic means before mentioned are still useful in these cases. On the other hand, the depression of the external orifice of the fistula, the characters of pus containing cheesy matter, and, lastly, bacteriological and microscopical examination of the matter discharged will be sufficient to indicate the tubercular nature of the affection.

Malignant tumors may attack the epididymis as well as the vas deferens. These neoplasms are very numerous, such as sarcoma, diffused or cystic epithelioma, enchondroma, etc. But it is extremely infrequent that a malignant growth begins in the epididymis, and in the large majority of cases the testicle is the first diseased.

In cases of cancer of the epididymis, the pains are lancinating and spontaneous; the age of the patient, the usually large size of the tumor, the rapid growth of the latter and the condition of the lymphatic glands, and especially the absence of tertiary symptoms present at the same time, as well as the uselessness of the iodides, will allow us to eliminate the diagnosis of syphilis.

Regarding cysts of the epididymis, we know that they are often met with on the convex aspect and on the free end of the caput of the epididymis, and occasionally near the tail of the organ. In the beginning, when the cyst is only the size of a bean, its consistency may appear hard, and transparency and fluctuation will not as yet appear. Its indolence and localization will, however, allow us to make out its nature. Later on, when it is larger, it will be no longer hard to the feel, and in many cases fluctuation will be made out, but we must always remember the possible presence of a gumma undergoing softening, and specific treatment should be tried. Puncture may, perhaps, be recommended, but it is not perfectly legitimate, excepting when the treatment and the absence of tertiary symptoms will have allowed us to eliminate the possibility of the lesion being of a syphilitic nature. These considerations are also applicable to spermatocele.

As to gumma of the scrotum and vaginal membrane we will not insist, because an error in the diagnosis in this case is not a bad point for the patient, the treatment being the same, and, for that matter, the ease with which the tumor slides over the underlying tissues in both cases; the frequency of the vaginitis in the second will be sufficient for us to make a localization of the new growth.

The prognosis is excellent in the disease under consideration, and all trace, with the exception of a slight induration, will disappear after a certain time, when proper therapeutic measures have been employed and for a sufficiently long time. It is useless for the writer to insist upon the treatment of this lesion; it naturally requires a specific one, and, as each one has his own methods of prescribing mercury and the iodides, it is unnecessary to insist upon any detail here; suffice it to say that the mixed treatment is considered as by far the best by the writer, and that this should be persisted in for a sufficiently long time.

ORTHOPÆDIC OPERATIONS AT THE HOSPITAL FOR THE RUPTURED AND CRIPPLED, FROM OCTOBER 1, 1895, TO OCTOBER 1, 1896.[1]

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IN presenting a paper on orthopædic operations, I have no desire to dwell at length upon the necessity for operations in orthopædic surgery, but merely to give a record of the facts that I have been able to secure in analyzing a year's work. The mechanical features still maintain the most prominent place in the treatment of deformities and diseases of the joints, and it is my purpose to present an analysis of cases treated in this way before another society whose work is not as strictly surgical as is that of the New York Surgical Society. All the operations performed, with rare exceptions, are supplemental to mechanical treatment. Indeed, the operative and the mechanical methods go hand in hand. It is my aim, for instance, when a deformity cannot be corrected by one method to resort to the other, and *vice versa.* Where mechanical means, coupled with the hygienic, are insufficient to rid the patient of a focus of disease in the bone, the plan is to have recourse to operative measures, and when this focus is entirely removed, the mechanical is often continued for a while, in order to secure the best functional results of the limb. The Hospital for the Ruptured and Crippled aims to give relief in the best way possible, irrespective of the course pursued to secure this object.

Analyses of cases operated upon during a year which has so recently passed must necessarily be more or less incomplete. One must distinguish between the immediate result and the final result. It has been my aim in preparing this paper to secure the final results rather than the immediate. It often happens that several months will elapse between the date of an operation and a recurrence of symptoms for which the operation was originally done. Frequently the patients passed from the control of the hospital, and the instructions, which were so explicit, have been completely ignored. Later on these same patients returned for treatment, and our records sometimes show a bad result. While it is hardly fair to attribute this result to the former treatment, I have done so, rather than subject myself to adverse criticism or to the charge of "manufacturing statistics."

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[1] Read before the New York Surgical Society, December 23, 1896.

The terms used in the table of results are "cured," "improved," "unimproved," "died." In defining the term *cure*, I find some little difficulty in securing a proper definition. Naturally, when a patient is cured of a disease, the functions of the limb or the organ diseased should be fully restored. When we say, therefore, that hip-disease is cured, we mean that the disease is not only eradicated from the system, but the functions of the hip-joint are fully restored. When, again, we speak of curing a patient of deformity, we mean that the deformity no longer exists. A cure may, therefore, have been effected, and yet the function of the joint not restored; but it must be remembered that we do not speak of the disease in this instance, but of the deformity. When a treatment is being followed out for the cure of sinuses, and the sinuses cease to exist under this method, we may speak of the sinuses as cured. The same is true of abscesses. The term cure, then, must be understood as a relative one, and, as it relates to disease, not only the removal of the disease, but the restoration of the function of the joint. When it relates to deformity, or sinuses, or abscesses, it means that deformity no longer exists, and that a sufficient length of time has elapsed to make it reasonably sure that the deformity will not recur. So of sinuses and abscesses.

In using the term *improved*, I wish to convey the impression that the patients themselves have actually benefited by the operation, as shown by our records, and yet it is difficult, often, to measure the exact amount of improvement. For instance, one patient may be benefited a little, and the condition such that improvement is sure to continue, while another patient may be benefited to a high degree, and be practically cured, yet the term cure is not here employed, but simply improved.

Unimproved is employed to mean that the patient has derived no benefit whatever from the operation, and is really worse than when the treatment was begun.

The term *death* after an operation does not necessarily mean death by reason of the operation, but death within a week, say, of the operation, where one cannot always decide how important was the element of shock in producing the result, how grave the trauma inflicted upon the kidneys by the operation itself. Naturally, one would expect few deaths from operations of this kind, because the majority of them are done, not *in extremis*, but, as aforesaid, supplemental to mechanical means. In a few cases the operation is done to save life, and then it can be dignified with the term capital.

Three hundred and fifty-two operations have been performed during the year just ended, and of this number, 113 were performed in the course of hip-disease, 13 in the course of spinal disease, 21 in the course of disease about the knee-joint, principally tubercular ostitis, 8 for the relief of paralysis involving one or both lower extremities, 43 for the relief of talipes, which includes the different varieties of club-foot, some congenital, some paralytic, 5 for congenital dislocation of the hip, 3 for tubercular ostitis of the tarsus, 1 for tuberculous ostitis of the ischium, 2 for ostitis of the tibia, 1 for osteomalacia, 1 for osteosarcoma of the head of the tibia, 2 for deformity of the upper portion of the shaft of the femur after fracture, 1 for slipping patella, 1 for rheumatic arthritis, 2 for torticollis, and 1 for tuberculous dactylitis.

OPERATIONS IN THE COURSE OF HIP-DISEASE.—(1) The employment of manual force under an anæsthetic, popularly known in the hospital as "*stretching*." In this procedure there is no cutting, either subcutaneously or by the open method, but the pelvis is held firmly by an assistant, and the operator proceeds to correct deformity by manual force, feeling his way carefully, taking all the time that is necessary, and not employing brisement forcé. The cases subjected to the treatment are usually of long standing, and there are no acute symptoms, nothing to lead one to feel that he will do damage to the hip by trauma so inflicted. Another class of cases is that where the symptoms are very acute, where the deformity is very acute, too acute for the employment of any mechanical measures, such as apparatus or weight and pulley. In such instances the deformity is never fully corrected, but simply reduced so that mechanical means can be employed to advantage. I confess that I have always entertained some fear in inflicting any trauma upon the hip, and in going over the cases upon which this analysis is based, there are presented results of cases termed old—that is, where the disease had spent itself—and cases of recent date.

There were 54 cases, of which 41 were in-patients who had suffered from the disease for three years and over, and whose hips seemed to have been long free from any acute manifestations. Of these 41, 32 were improved (1 of which relapsed), 6 were unimproved, and 3 were cured. The operation was performed in 13 of recent date, under two years of age, and of this number 12 were improved, and to all appearances permanently improved, while 1 was unimproved. Frequently, the house-surgeon appeals to me on behalf of a patient suffering at night and by day, where all manner of traction fails to give relief, where opiates must be employed, and where it is difficult to attend to the wants of said patient by reason of the extreme tenderness of the limb. His appeal is to have the limb brought down under an anæsthetic and put in a snugly-fitting plaster-of-Paris bandage. It is surprising how prompt relief is afforded in nearly every instance. The night-cries cease, patient can be lifted from the bed and put on a cart, wheeled from ward to ward, to the roof for fresh air, and his whole condition is vastly improved.

(2) *Osteotomies.*—In every instance this operation has been

a subcutaneous one. The instrument employed is a narrow osteotome, which is sharp enough to be thrust through the skin and underlying soft tissue down to and through the periosteum. The instrument is inserted in the long axis of the limb, and when it reaches the bone is turned at right angles with the shaft. With the osteotome, then, as a probe or director, one can easily determine just where he is making section of the bone, and can within a short time get the bone sufficiently divided to make its fracture by manual force at this point very easy. The point selected has been just below the trochanter minor. Of eight cases thus operated upon for the relief of deformity, six were cured and two were improved.

One patient was subjected to cuneiform osteotomy for the relief of this deformity, and appeared to get a very good result. She returned to the hospital a year or two later with a recurrence of the deformity, and a simple osteotomy effected a cure. This was a girl, thirteen years of age, who was admitted February 1, 1894. Her disease dated from her fourth year. It was difficult to obtain a satisfactory early history, but she wore apparatus at different times without any special benefit. At the time of admission her left limb was flexed at a right angle with the body. By careful measurement it was exactly 90 degrees. The length of the limbs showed a difference of two inches, as measured from the anterior superior spinous processes, five and a quarter inches from the umbilicus. This was her practical shortening. The adduction was quite marked. February 9 of that year an attempt was made under an anæsthetic to correct the deformity by manual force, but ankylosis seemed so complete that a cuneiform osteotomy was done, the wedge taking in the trochanter and what remained of the head and neck. After dividing subcutaneously the adductors, the limb was easily brought to 160 degrees. The wound healed without an incident, and she was discharged a few months later, walking very well and showing very little deformity. She was readmitted during the last year, and was operated upon by a simple osteotomy, which resulted in complete relief of the deformity. She was retained in hospital for some months, during the larger part of which time she was without any appliance, and was discharged cured May 31, 1896.

A second case was subjected to cuneiform osteotomy, one of the two where a fracture had occurred, and resulted in marked outward bowing of the upper portion of the shaft of the femur. This was in a girl, T. R., five years of age, admitted to the hospital, and operated upon November 26, 1895, by removing a wedge-shaped piece of bone from the outer side of her femur, just below the trochanter major. The limb was brought into excellent position, and over a full dressing plaster of Paris was employed. Within a fortnight she developed signs of septic infection, and on removing the dressings the wound was found to be septic. She lost flesh rapidly, and she responded very poorly to stimulants. It was soon evident that she was in for a pretty sharp attack of pyæmia, as one or two abscesses formed about the body were opened, and still the case progressed from bad to worse. While she lay on the water-bed, and while all hope seemed to have been abandoned, we were induced to make use of the compound oxygen (known as Northrop's), which was analyzed for me at Columbia College, by Mr. H. T. Vulte. He reported on February 5, 1896, as follows:

Carbonic acid gas	(CO_2),	1	per cent.
Oxygen	(O_2),	22½	per cent.
Nitrogen	(N_2),	18	per cent.
Nitrogen monoxide	(N_2O),	58½	per cent.

He added in his report the following: "I do not think that any gas carried or transported in this manner is a fair sample for analysis, as diffusion is taking place at all times through the rubber bag, and I should much prefer to make a test on cylinder gas." I was unable to secure the gas in cylinder, but the manufacturers assured me that the analysis was very nearly correct. I am confident that her life was saved by the administration of this gas at this time. She began to improve within a day or two after its administration, and the improvement continued until she made a good recovery, barring the deformity of the limb. A sinus persisted a long while. I propose, now, to do a simple osteotomy, and expect to obtain a perfect result.

(3) *Curettings.*—Twenty-eight. Eighteen improved, three cured, seven unimproved. Two of the unimproved cases developed amyloid degeneration.

It is the practice of the hospital to curette sinuses that persist for a long while, and to enlarge the openings, giving better drainage. The number of times that this is done is immaterial. The aim is to cure as many of these as possible. Sometimes after a thorough curettage, where five or six sinuses exist, two or three of this number will be cured. After another, probably one, and so on in this way until we are able to dispose of the entire number. The plan is to thoroughly curette in the track of the sinus, to dry it out thoroughly with iodoformized gauze on a director or probe, to then inject the peroxide of hydrogen, full strength, wash out thoroughly, and to insert a small tent of sterilized gauze, removing this within a day or two. In some sinuses we omit the tenting. I am free to say, however, that I am as yet unconvinced that the iodoform injections are of any special value. Where the sinus leads unmistakably to a focus of bone, it is very much enlarged, the bone focus is reached with the curette or a chisel, and an attempt made to remove all broken-down bone until we come to hard bone tissue. Frequently in curetting a hip sinus, for instance, I find myself before the close of the procedure removing the head of the femur or a portion of the trochanter or a portion of the neck. Where the sinuses persist in spite of the curetting, it frequently becomes a question whether to do a radical excision or an amputation, and I am firmly convinced that, if amputation were done a little more frequently, amyloid degeneration would be forestalled. The rules governing are very simple,—namely, if the urine is of low specific gravity and continues thus low, the chances are that this condition of liver and kidneys is in progress, and further time should not be lost.

(4) *Abscesses.*—Nine cases operated upon. Two were cured, seven improved. In one instance, where the disease was extracapsular, a good result was obtained.

A boy, C. F., nine years of age, was admitted July 23, 1896, for the relief of hip-disease. After a few days' observation in hospital it was decided that he had no hip-disease, because the symptoms and signs were sufficiently well pronounced to exclude this in the diagnosis. The small abscess, which was located a little below the trochanter major, was opened on August 4, and was found to lead directly to a focus in the shaft of the bone, just below the epiphyseal line. The area was small, and it was easily removed by a sharp spoon. The cavity was packed lightly, and on September 5 it was curetted. Shortly after this it closed, and the boy is cured,—that is, by November 1 there were no signs whatever of any disease in or about his hip. The functions of the joint were perfect. He is still in the hospital awaiting discharge, wearing no apparatus, free from lameness and disability.

(5) *Excisions.*—Twenty-seven cases. Five cured, thirteen improved, seven unimproved, two died. Five of the unimproved cases developed amyloid degeneration, and the cases are practically hopeless. Two of the improved cases died later, one of tubercular meningitis and one of pulmonary consumption. One of the unimproved cases died at the end of a week of acute uræmia.

It is not our rule to excise the hip in all cases when abscess presents, but to employ protection treatment, to work rather on the expectant plan, to incise abscesses or excise them where the disease seems to be under control; but where this is not the case, to do a resection of hip. It thus happens that the cases are pretty well advanced before coming to this radical operation, and in many instances the operation is resorted to in order to save life. Whether it is better to excise early or late is still an open question, because it is well known that many cases under good mechanical treatment do recover where numerous sinuses and abscesses exist. A few cases, by way of illustration, may emphasize the point more clearly.

For instance, take that of K. C., a girl, who was admitted to the hospital on January 24, 1894. She had been a sufferer for nearly a year, had worn an exceedingly efficient apparatus so far as all appearances went, and yet, in spite of this, an abscess had already formed, which could be made out just above Poupart's ligament, and which involved the inguinal glands as well as those in Scarpa's space. The hip was, therefore, quite tender, and the apparatus failed to give relief. She was put up in a plaster-of-Paris, skin-fitting bandage in March of that year, and the acute symptoms subsided. About this time, however, she contracted diphtheria, was sent to the Willard Parker Hospital, and on April 16 returned, convalescent. At this time a deep femoral abscess was aspirated, and from one to two ounces of pus evacuated. In May she was so much improved under extension in bed and general constitutional treatment that she was permitted to leave the hospital, her hip protected by a long splint. At this time her parents lived in the country, and it was thought that a change would be about the best treatment she could have. She was readmitted on August 2. This fluctuating mass in the femoral region had encroached so much upon the skin that it opened spontaneously, and several ounces of pus were discharged. Shortly after this the sac was curetted as thoroughly as possible, but by September 11, having obtained some relief as noted in the diminution of the discharge, she was again allowed home. She returned about two months later, and on January 7 she appeared so much exhausted by this continued discharge that excision was advised and performed, under nitrous oxide, with a good immediate result. The head of the femur, part of the trochanter, and all of the neck were removed. Some of the large glands in Scarpa's space were dissected out quickly, and the operation soon completed. About this time her urine was of low specific gravity, but as yet no trace of albumen had been discovered. The wound soon closed down to small sinuses, and on July 13, 1896, she was so much improved that it was deemed best to discharge her again. At this time there was only one sinus. Two had already closed. She has been treated as an out-patient, the mother having been taught to dress the sinuses. Quite recently, however, report comes that her feet are swollen, and on securing a specimen of urine it is found loaded with albumen, and although we failed to find hyaline casts, we feel convinced that the kidneys are diseased. At all events the liver is larger, and the diagnosis is now amyloid degeneration from prolonged suppuration. This case has had the very best of care and hygiene, and yet no treatment has been sufficiently radical to remove all foci of disease. Whether an amputation will succeed in effecting a cure, of course, is open to grave doubt, and the parents will probably object.

Another case, N. L., a boy, eleven years of age, was admitted May 1, 1896, and operated upon July 21 for an extensively suppurating hip. The acetabulum was much involved. The operation was done rather hurriedly, because of the enormous amount of hæmorrhage which was difficult to control, but it was thought that all the foci of bone had been thoroughly removed. The hæmorrhage continued for nearly a week whenever any dressing was employed, and for the last six months he has been failing. The wounds have developed into a large fungous mass, the hip has been much more prominent, his urine has presented many suspicious features, and on December 19, under nitrous oxide, I enlarged the openings, and found, to my amazement, a large piece of gauze, about the size of an English walnut, filling the acetabulum and crowding the shaft of the femur out of position. The first operation was done during the summer while I was absent from the city, but was done by a very competent member of my staff. I am sure that this mass of gauze has been in the acetabulum since the first operation. It was applied then to check hæmorrhage, and in the subsequent dressings had not been recognized. On removing this I found the acetabulum pretty clean, but the end of the bone was very much eroded, requiring section at this point. After section the pus was found in the medullary canal, and on inserting a long, sharp curette I found the pus extending quite down to the condyles. I hurriedly washed this out, dried pretty thoroughly with iodoformized gauze, and tented. The boy has done remarkably well since the operation. His improvement has been most pronounced, and the two or three dressings subsequent to this last operation have been attended with very little pain and very little discharge.

NOTE.—February 4, 1897. He has died recently of pulmonary tuberculosis.
V. P. G.

So much for two desperate cases. Two cases, now about to be reported, have done remarkably well.

One, a boy, W. K., who had been a private patient of mine for two or three years, developed one or two abscesses during that period, which abscesses were incised and very satisfactorily drained, was losing flesh, and was evidently deeply affected by septic material. He was admitted July 8, and operated upon the same day. The operation was done very quickly, under ether, the head and neck of the femur removed, acetabulum thoroughly curetted, and the shaft of his bone was found so much diseased that the medullary canal was curetted and packed. After a full dressing he was put up in plaster of Paris. He bore the operation very well, and I find noted July 10, 1896: "His temperature has not reached 102° F. since the operation. There has been practically no shock and very little pain. He is dressed this morning. The gauze contains very little pus. In place of the gauze tent in the shaft of the bone a long drainage-tube is inserted.'' September 17: ''The right limb is one-half inch shorter than its fellow, as measured from the anterior superior spinous processes and the umbilicus. His limb is perfectly straight, free from pain. Sinus is still open; tube still employed. Is dressed every other day. Is doing well.'' November 6: ''Tube came out the other day. Small opening on the anterior surface of the thigh. The tube is not replaced. His general condition is excellent, and his recovery seems well assured.''

Another, a girl, R. F., ten years of age, was admitted May 1, 1896, for the relief of hip-disease in the second stage. An abscess had already made its appearance. Expectant treatment was employed, and this treatment included the aspiration of an abscess two or three times, but without any benefit. On July 27 I attempted an aseptic operation. The abscess was near enough to the joint to be included in the incision. The head of the bone was removed, acetabulum curetted, and every vestige of the abscess-sac removed. The first dressing, which was held in place by a plaster-of-Paris bandage, was removed at the end of four weeks, and primary union was found to have resulted. A month later she developed scarlet fever, and it was fully two months before convalescence was fully established. She suffered very much in general health, but there was no recurrence of any disease at the hip. After returning to the hospital her nutrition was very much improved, and she was finally discharged, a month later, practically cured,—that is to say, there was no sign of disease, the joint was not tender, the limb was of very nearly normal length, functions of the joint were improving, and she went home with a convalescent jointed brace. Reports from her home quite recently confirm the prognosis.

(6) *Amputations.*—One, which was done *in extremis*, an excision having previously failed. The parts sloughed to such an extent that the limb was simply held to the body by bands of muscular tissue. It was thought that by relieving him of the limb his life might be prolonged, but he died a few hours after the operation.

SPINAL DISEASE.—(1) *Curettings.*—Seven cases. Two cured, two improved, three unimproved. One of those unimproved died later of exhaustion.

(2) *Abscesses.*—There were six cases in which abscesses

were operated upon. Four were improved (one of which relapsed and died later), two unimproved (one of these now has developed amyloid degeneration).

OSTEITIS OF THE KNEE.—(1) *Stretchings.*—There were fifteen cases, one of which was subjected to the operation four times; one, twice. Result: three cured, twelve improved. Many of the cases were curetted, and no accurate record was kept.

(2) *Exploratory Incisions.*—One case; cured.

(3) *Excision.*—Two cases; both healed primarily, but one patient, who had tubercular disease of the vertebræ at the time of operation, developed, either before or soon afterwards, pulmonary consumption, from which she died.

(4) *Amputations.*—Two cases; both cured.

A boy, W. N., was admitted in January, 1894, for a tubercular knee. There was no deformity, but a fluctuating tumor, involving the knee, which tumor was aspirated from time to time, and later was subjected to iodoform and glycerole injections, without relief. He was also subjected to salicylic acid injections with negative result. The knee was never a painful joint. Finally, in April, 1895, the knee was freely incised, the cavities thoroughly curetted, and very nearly a complete arthrotomy performed. The wounds did not heal, other abscesses formed, his liver and kidney were finally involved, and on November 26, 1895, an amputation was done under nitrous oxide. The patient rallied well, and the flaps healed, with the exception of one or two points. Improvement was most marked in general condition. The liver receded, his urine became more nearly normal, and the last report, which was December 15, 1896, was that he was going about on crutches, general health very good, and cured.

A girl, I. H., three years of age, was admitted March 18, 1895. There were numerous discharges about the knee, all discharging profusely. Attempts were made from time to time to relieve these by curetting and by fixation, but the disease progressed. She lost flesh, liver became enlarged so that it could be distinctly felt below the free borders of the ribs fully three fingers' breadth. The urine was loaded with albumen. Finally, on December 3, amputation was performed, and rapid improvement followed. About three months later an acute attack of nephritis developed, and she came near succumbing to this. Prior to this time, however, the left knee became involved. The parents insisted on removing the child, and although the wound was healed, they were urged to leave her in the hospital. She was accordingly discharged on April 19, 1896, unconditionally. Tracing her out recently, she was found, December 23, 1896, in very good condition; no albumen in the urine. Liver has receded, the stump is well healed, and the disease in the left knee seems to be insignificant.

PARALYSIS.—(1) *Tenotomy.*—Three cases; one cured, two improved.

(2) *Myotomy.*—Four cases; four improved.

The operation most frequently resorted to is a simple subcutaneous tenotomy or fasciotomy. This operation is a simple one and is performed at the site of the tension. The limb is extended to its full limit, while the tenotome is inserted to the side of the tendon or fascia, and passed beneath the skin with a cutting edge turned against the tissues. It is astonishing how much relief to deformity one can afford by this means. Just after the cutting the limb is extended still farther, and the operator's finger is pressed over the skin between the tissues severed, until the full limit can be attained. Where this measure fails and where the muscles themselves seem to be structurally shortened, the muscles lying deeper than the superficial fascia and tendons, an open section is made in the vertical axis of the limb towards the outer side. The incision is about two to three inches in length. After the muscular tissue is reached, the skin is drawn aside with retractors, exposing the shortened muscles. The division now can be made with a scalpel or scissors, with one's finger underneath the tissues as a guide. It often happens that one can grasp the muscles with the thumb and forefinger, and the section can be made with blunt scissors. It is frequently necessary to divide all these structures until the capsular ligament is reached. The limb can then be fully extended. The hæmorrhage is not great, and what oozing occurs can be controlled by very hot sterilized water. After the deformity is corrected, a counter-opening is made on the outer and posterior aspect of the hip, through which opening a half dozen threads of catgut are inserted for drainage. The anterior wound is then sewed through with silk or catgut, as one prefers, full dressing applied, and plaster of Paris over all this, extending from the foot to the middle of the thorax. Healing occurs very promptly, and within a fortnight the dressing can be removed. While apparatus is being made, a second plaster-of-Paris bandage can be employed, or weight and pulley, by means of adhesive plasters, may be used.

Take this illustration of the following case: A large adipose girl, N. L., aged twelve years, was admitted to the hospital on January 3, 1896. She came from Biltmore, N. C., and from infancy her mode of progression had been quadrupedial. She was totally unable to stand erect, or even to get about with crutches. Several groups of muscles were completely palsied, while certain muscles retained power, and these were, as a rule, very much shortened. Her angle of greatest extension on the right side was 140 degrees at the hip; left, 135 degrees. Her right knee could be extended to 170 degrees; left to 130 degrees. The Achilles tendons were shortened. Soon after admission the operation just described was performed, and the deformity in both lower extremities fully corrected. The operation was not attended with any shock, the wound healed rapidly, and at the end of three weeks the plaster was removed. Braces were soon applied from the pelvis to the feet, and within a month she was standing erect. The apparatus has been so constructed that motion can be had at the knees or at the hips. She has remained in the hospital learning how to walk, and for the last six months has been going about without any support, other than the apparatus affords. Recently I have tested her without braces, and she can make a very good effort at standing alone, The muscles are developing. There is no recurrence of the deformity. Her confinement to bed reduced her flesh, and she is no longer the obese girl she was. The prognosis is that she will be able to walk with much smaller braces, much shorter, and ultimately get about with very slight support attached to her shoes.

TALIPES.—(1) *Tenotomy.*—Fifteen cases, one of which underwent two operations. . Result: six cured, nine improved.

(2) *Stretchings.*—Fifteen cases, one three times. Result: cured, six; improved, nine.

(3) *Astragalotomy*, supplemented by stretching later. One case, improved.

(4) *Phelps's Operation for Varus.*—One case, improved.

(5) *Willets's Operation for Calcaneus.*—Two cases, both improved.

(6) *Arthrodesis.*—Six cases, all improved.

(7) *Tendon-Grafting.*—Two cases, both improved.

(8) *Cuneiform Osteotomy.*—One case; unimproved.

In treating talipes, our aim is to correct deformity, first by apparatus or by plaster of Paris frequently applied, known as the Wolff method, which consists of putting the foot up in plaster of Paris, in the best possible position, without an anæsthetic, making a section through the plaster before it is quite hard, over the mid-tarsal joint. On the outer side of the foot this section is converted into a cuneiform opening. A day or two later the foot is, by manual force, still further everted and held in position, while a light plaster-of-Paris bandage is applied over the middle of the foot. Later, this is removed and still further eversion is made, and so on, until a new plaster dressing can be applied, with procedures as before. Where we fail in the above methods, a deformity is often corrected under an anæsthetic, and the foot put up in plaster of Paris. Cutting operations consist of the open method, according to Phelps, where inveterate varus exists, and removal of the head of the astragalus. Sometimes complete removal of this bone, cuneiform osteotomy and occasionally a supramalleolar osteotomy.

In paralytic cases Willets's operation is performed for shortening the tendo Achillis. We also resort to tendon-grafting, and for flail-foot arthrodesis is the preferable operation. All of the cases thus operated upon have been improved, but it is too early, as yet, to predicate the cure. The procedure which I prefer is an anterior vertical section over the joint, extending well up on the tibia and down over the mid-tarsal region. The tendons can be easily drawn aside and the joint reached. The next step is to remove the articular cartilage from the top of the astragalus, from the lower end of the tibia, and from the inner facets of the malleoli. One can make the astragalus and the tibia fit like a mortise, if desirable, and thus secure better fixation of the joint. I have found it necessary, however, to remove the articular cartilage from as many of the mid-tarsal bones as I can get at, so as to secure synostosis in this region. Unless this is done the bony union at the tibio-tarsal joint breaks down sooner or later, but with all the little joints in this neighborhood secured by bony union, the result is excellent.

Tendon-grafting has not been a very popular operation, but the results thus far obtained are satisfactory.

RHACHITIC DEFORMITIES.—There were twelve cases, with twenty-four operations for bow-legs. The operation consisted of simple subcutaneous osteotomy. The result: all cured.

For knock-knee there were twenty-seven cases, with fifty-four operations. The operation was the supracondylar operation of Macewen, modified by McCormack. This modification is simply a division of the bone from the outer side rather than the inner. It is done as in bow-legs, subcutaneously. The limbs are put up in position of bow-legs, and union takes place in from four to six weeks. All were cured.

PAUL PAQUIN'S SERUM IN TUBERCULOUS BONE-DISEASE.—During the year I have treated seven cases of tuberculous bone-disease by means of the Paquin serum, kindly furnished me by Dr. Paul Paquin, of St. Louis. I am indebted to my house-surgeon, Dr. J. H. Waterman, for full notes of the cases.

No. 1 was treated from July 22 to November 1, getting in all, 635 minims, without any improvement. This was a case of Pott's disease of the spine, with compression paraplegia.

No. 2, a girl with tuberculous disease of the spine and knee, complicated by a pulmonary tuberculosis. Got 400 minims in all during a period of two months, without any relief whatever. She died, September 23, of pulmonary disease.

No. 3 was a girl with disease of the hip, tuberculous in nature. She got from August 16 to the middle of September 500 minims. During this period the abscess increased in size and the disease became more acute. The patient really grew worse under the treatment.

No. 4, a girl with double hip-joint disease, tuberculous in nature, had the serum from July 22 to November 1, 700 minims in all. She did not gain in weight, nor did the condition of either hip improve. It will be necessary to excise one or both hips.

No. 5. Case very much like the preceding, except that one hip was involved, but this was unusually acute. The treatment in her case extended over one month and 300 minims were administered. We could see no improvement whatever.

No. 6, a boy with tuberculous hip-disease, had 700 minims without improvement. The details are unnecessary.

No. 7, a boy with an abscess from tuberculous disease of the hip, was treated very carefully for one month by serum. During this time he lost flesh. He received 300 minims and his condition was unimproved.

It was observed that a rise in the temperature of all these cases followed the injections, but this rise of temperature was not marked, as many of the cases had a rise of temperature every day before the serum was begun. There was no increase of weight, nor was there any change in the condition of the child. Nothing to indicate an arrest of the disease. Careful examinations were made in every instance before the serum treatment was begun, and from time to time during its progress. In no single instance did any collapse follow the injections, but all the patients bore them well. In three cases an urticaria followed the injections, but would disappear within twenty-four hours after its administration. I did not continue the treatment in the cases reported, for the reason that Dr. Paquin, in one of his papers on serum therapy, states that the length of time that the treatment was continued varied in many instances. Some cases being on it for over two months and others under observation for many months, but it was observed that the improvement was noticed in a vast majority of cases after a few injections had been given, either an increase in weight or a perceptible diminution in the progress of the disease, or, at least, the disease had not progressed as rapidly as would have been anticipated under the usual conditions. We fail to find any such result, and I desire to place our experience on record.

OBSERVATIONS UPON THE ABSORPTION OF FLUIDS BY THE PERITONEUM.

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OF CHICAGO.

THE fact to account for is that fluids rapidly disappear from the peritoneum of living and recently dead animals. To give a satisfactory account of this fact we must study the paths of absorption from the peritoneum,—*i.e.*, whether the fluids pass out of the peritoneal cavity by way of the lymphatics or by way of the blood-vessels. By what force is the fluid in the peritoneal cavity induced to leave it? The questions to ask are,—

(1) Is peritoneal absorption produced by "vital" processes of the peritoneal cells, so-called, "vital forces"?

(2) Is it produced by the increased intra-abdominal pressure?

(3) Is it produced by filtration?

(4) Is it produced by capillary or molecular imbibition?

(5) Is peritoneal absorption produced by osmosis?

(6) Is it produced by stomata?

The conditions under which absorption of peritoneal fluids must be studied are, what are the concentration and nature of the fluids, (*a*) isotonic, (*b*) hypotonic, or (*c*) hypertonic,—*i.e.*, what is the nature of the fluid in relation to the blood?

Also a significant position in the peritoneal absorption must be given to the so-called lymph-spaces, or rather to the vast interstitial spaces.

First, as to the peritoneal absorption being due to so-called vital-cell processes we may dispose of by the arguments that absorption will proceed many hours after death, as proved by our experiments. This fact was started by von Recklinghausen in dead rabbits, developed by Ludwig and his pupil, and revived by Hamberger. Also energetic chemic or thermic injuries to the peritoneal endothelia does not prohibit peritoneal absorption of fluids.

Doubtless peritoneal absorption is distinctly more of a physical process than a "vital" process. Yet some distinguished modern investigators claim that the endothelia of the vascular system possesses secretory powers. When hours after death the peritoneum will absorb similarly to the living we must bring in other factors than vital forces to explain absorption. However, the peritoneum, perhaps, is not dead for half a dozen hours after the cessation of the heart-beats.

The second proposition, whether peritoneal absorption is produced by intra-abdominal pressure, must be considered as at least a distinct factor. I shall define intra-abdominal pressure as muscular tension, plus atmospheric pressure. Intra-abdominal pressure favors and hastens peritoneal absorption in direct ratio to the amount of pressure up to a certain point. Massage, kneading, or pressing the abdomen hastens peritoneal absorption of fluids. Position of the animal, as hanging by the heels, favors peritoneal absorption, but this hardly comes under intra-abdominal pressure, as hanging the animal by the heels simply allows the peritoneal fluids to come in contact with the centrum tendinosum, which appears, from experiment, to be the chief locality of peritoneal absorption. Besides, in some experiments, the peritoneal cavity of the dead animal was left open, so as to exclude intra-abdominal pressure, and the peritoneal absorption proceeded similarly to the closed abdomen, so that intra-abdominal pressure is but a small factor in the peritoneal absorption of fluids. But there are too many factors to discuss in intra-abdominal pressure in this short space. One factor, *e.g.*, brings up a wide field, as when the intra-abdominal pressure increases the abdominal veins and vessels meet a resistance by narrowing their lumen, which must be answered by more powerful heart-beats. Thus the entrance and passage of the blood-stream through the abdomen would be interfered with and hindered. Intra-abdominal pressure is also increased by the development of gas in the intestines.

As to the third question, of peritoneal absorption being due to filtration, we must consider that intra-abdominal pressure and filtration are closely related processes. Filtration of fluids from the peritoneal cavity must suppose that the pressure in the peritoneal cavity is higher than the adjacent tissue. The almost continual activity of the animal, through the heart activity, muscular contractions, respiratory diaphragmatic movements enhance peritoneal absorption,—*i.e.*, aid filtration. Filtration and intra-abdominal pressure indicate a purely physical or mechanical and not a vital process in peritoneal absorption of fluids.

The fourth question, of peritoneal absorption by capillary or molecular imbibition, is difficult to dispose of. By capillary imbibition is understood the absorption of fluids by the pores of a porous substance,—*i.e.*, the permeable, stomatized capillary wall, or the pores of any kind of tissue. Molecular imbibition is the absorption of fluids in homogeneous masses, a kind of cohesion of matter. For example, it is occasionally observed in some experiments, especially in those on the dead peritoneum, that the subserous tissue is œdematous, succulent, or imbibed. Almost any tissue will take up more fluid than it ordinarily contains. But tissue under favorable circumstances will imbibe until it is considerably saturated. All tissue has a limit to its imbibition power, and hence can only take up a certain volume. But the factor of imbibition process in peritoneal absorption is certainly limited, for time and time again, in a small animal, after the peritoneum had absorbed 6 per cent. or more of the body-weight, careful examination revealed no visible or palpable œdematous or imbibed subserous tissue. If in the process of imbibition is included that of carrying away the peritoneal fluids by the small vessels or capillaries (blood and lymph), then imbibition certainly plays a considerable *rôle* in peritoneal absorption.

As to the fifth proposition, that peritoneal absorption is produced by osmosis, we become at once plunged into difficulties on account of the complications accompanying the process of osmosis. I will quote Professor Heidenhain's proposition on osmosis to show his views of what it is.

"(1) If two watery solutions with the same osmotic pressure are separated by a membrane through which diffusion can take place, no change in volume occurs on either side of the membrane.

"(2) If the solutions on either side of the membrane are of unequal osmotic pressure, water passes from the side where the pressure is less to the side where the osmotic pressure is greater.

"(3) The osmotic pressure of a solution is equal to the sum of the partial pressures of the various dissolved substances.

"(4) If the solutions on the two sides of the membrane have the same total osmotic pressure, but unequal partial pressures of their various constituents, each constituent of the solution passes from the side where it has the higher partial pressure to the other side. No change in the volume of water on the two sides takes place."

In peritoneal absorption, no doubt, osmosis plays the most significant *rôle*. All of Professor Heidenhain's propositions will not be generally accepted. The permeability of different membranes to different substances is not yet exactly known. Starling goes so far as to deny all of Heidenhain's above propositions in regard to osmosis, except the one marked 3. The propositions 1, 2, and 4 require conditions seldom fully met in the body. In osmosis the nature of the membrane must be carefully considered. In general, osmosis is the tendency of fluids of different density to mix either when in contact or when separated by a membrane. The fluid-current is directed from one fluid of less density towards one of greater density or greater osmotic pressure. For example, in experiment No. 26, the fluid injected into the dog's peritoneum was 2 per cent. NaCl (hypertonic), and we collected thirty cubic centimetres in excess of the peritoneal injection in thirty minutes,—*i.e.*, the fluid (2 per cent. NaCl solution) injected into the peritoneum was more dense than the adjacent fluids, so that a fluid current was directed from the less dense fluid in the tissue towards the fluid in the peritoneum. Experiments show that when a NaCl solution of less than 0.75 per cent. be injected into the peritoneum it rapidly absorbs,—*i.e.*, the smaller the percentage of NaCl in the solution the more rapid do they disappear from the peritoneal cavity. But other factors arise in animal life which off-set this rule, as in Experiment No. 28, a rabbit, weighing 713 grammes, absorbed seventy-five cubic centimetres of a 2 per cent. NaCl solution in thirty minutes. The fact is, there are so many unknown forces at work in the peritoneum of living animals that we are so far unable to formulate such hard-and-fast rules in regard to osmosis as are laid down by the able Professor Heidenhain. However, it appears to me that the disappearance of fluids from the peritoneum is generally best explained by the law of osmosis, aided, doubtless, very much by filtration.

In this limited space we cannot discuss many of the complicated processes which should be included in the subject of osmosis, as the plan of the article is to present merely an outline of the physiology of the peritoneum from actual experiments on the living and dead animals. Isotonic fluids (say 0.75 per cent. of NaCl solution)—*i.e.*, those fluids which possess the same osmotic power as the blood—absorb very poorly or not at all by the peritoneum. If they do absorb, they first become hypotonic (*i.e.*, below the osmotic pressure of 0.75 per cent. NaCl solution), and are then absorbed by osmosis or intra-abdominal pressure; filtration accomplishes the act,—*i.e.*, mechanical pressure tells the story. If the fluid injected into the peritoneum be hypertonic (say above the osmotic pressure of 0.92 NaCl solution), the fluids in the adjacent tissue should, according to the law of osmosis, become directed towards that in the peritoneum which is hypertonic.

Isotonic fluids are stated by authors to range from 0.72 per cent. to 0.92 per cent. NaCl solution. Hypotonic solutions would then be NaCl solution below 0.72 per cent. Hypertonic solutions would be NaCl solutions above 0.92 per cent. The less concentrated (*i.e.*, the more it is hypotonic) a solution is the more it disappears from the peritoneal cavity. In other words, fluids disappear from the peritoneal cavity in inverse ratio to their osmotic pressure. The percentage for isotonic, hypotonic, and hypertonic NaCl solution varies for the osmotic pressure of different fluids, as the osmotic pressure cannot be the same as that in the thoracic duct, and that in the thoracic duct must be different from the fluid in the interstitial spaces. The problem to discuss in the appearing and disappearing of the fluid from the peritoneal cavity is, Does the fluid first enter the interstitial spaces by osmotic pressure, aided by other factors, or does it directly enter the blood-vessels?

The sixth question is whether the fluids in the peritoneum are absorbed by the stomata. It appears to me after some two years in investigation that the peritoneum possesses stomata. Of the four recent writers on the histology of the peritoneum, Muscatello and Kolossow assert that there are no stomata, while Notkin and Beck claim with equal vigor that there are stomata. In my mind there is no doubt of the presence of stomata in the peritoneum, and that the stomata of the centrum tendinosum are to a certain extent responsible for characteristic absorption of the diaphragm. From the day of von Recklinghausen's discovery (1861) until the present the vast majority of investigators of the peritoneum unhesitatingly assert that there are stomata in the peritoneum. However, the few modern investigators on the peritoneum who deny the existence of peritoneal stomata may interpret the phenomena, the three distinct features of structures in the peritoneum, stomata vera, stomata spuria, and interendothelial spaces remain to be accounted for. Modified descriptions neither change nor dispose of facts.

Of course, since the discovery of Bizozzero (1873), that the endothelia of the centrum tendinosum rests on a numerously-perforated membrana limitens (limited to the diaphragm), a physical basis has been given to the explanation of rapid and vast absorption of peritoneal fluid by the diaphragm. The interendothelial space (including stomata) must play a significant *rôle* in the absorption of peritoneal fluids,—in other words, this space with its stomata, permanent or transient, regulates to some extent peritoneal currents. The stomata (and even the interendothelial space) must dilate to allow the passage of leucocytes, but especially the solid particles of Berlin blue to gain access to the subserous lymphatics, in general, but especially to allow the filling of the vast bed of lymph-spaces and channels found in the centrum tendinosum. Even after death the peritoneum does not forget its function, for particles of Berlin blue and fluids pass from the peritoneal cavity into the lymphatics of the diaphragm just the same as if the diaphragm were alive. Hence, in the physiology of the peritoneum must be included as important factors the stomata and interendothelial spaces. Peritoneal absorption must be sought along the lines of osmosis, the interendothelial spaces with their stomata and filtration.

Rather a majority of modern investigators seem to favor the idea that peritoneal fluids are directly absorbed by the blood-vessels. To this view I am so far opposed. It seems to me much importance must be given to the lymphatics in the peritoneum in disposing of peritoneal fluids. I have carried on experiments on this subject for a year, and the vast majority of testimony has demonstrated that with ligated lymphatics the peritoneal fluids appear in the bladder about twenty minutes later than with non-ligated lymphatics. The peritoneum is itself a lymph-space. The blood-vessels are nowhere directly exposed to the peritoneal membrane. It would appear to me that the peritoneal fluids first enter the vast lymph- or interstitial spaces, whence they can spread through wide areas of connected interstitial spaces. Subsequently the fluid could enter the walls of the capillaries or veins. The interstitial spaces in the subendothelial membrane are exceedingly numerous and large and would hence accommodate considerable quantities of fluid. When the peritoneal fluid gained the interstitial spaces it could become diffused by muscular action and mechanical pressure. The rapid and vast absorption of peritoneal fluids, as taught by experiments, teach against flushing or irrigation.

For further information I refer the reader to the recent extensive labors of Hamberger and the excellent work of Heidenhain, Orlow, Cohnstein, Lazarus-Barlow, Starling, Tubby, Laethes, Adler and Meltzer, Wegner, Aschur, and others.

In the recorded experiments the highest percentage of absorption of the peritoneum during life was 10 per cent. of the body-weight. The lowest percentage of absorption was 0.88 per cent. The average absorption was 4 per cent. of the body-weight.

While dead, the highest percentage of absorption was 5.5 per cent. of the body-weight. The lowest was 0.83 per cent. The average absorption was 2.32 per cent. of the body-weight. The 10 per cent. body-weight absorption occurred in thirty minutes while alive. The 5.5 per cent. of body-weight absorption of fluids by the peritoneum while dead occurred in forty minutes. Should the time of absorption be protracted, doubtless the quantity of fluids absorbed by the peritoneum would exceed by far 10 per cent. of body-weight.

Detailed Report of Experiments.

Experiment 1.—Rabbit of about three pounds; injected three-ounce solution, 98° F., containing grains of carmine at 5 P.M.; killed next morning at nine o'clock. All fluids absorbed from peritoneum; no œdema; many leucocytes found on the centrum tendinosum. The quantity absorbed by the peritoneum in sixteen hours was 6.4 per cent. of the body-weight.

Experiment 2.—Rabbit three and a half pounds; injected three ounces of fluid with carmine in it at 8 P.M.; killed next morning at nine o'clock. All peritoneal fluids absorbed; no œdema; swarms of leucocytes were on the peritoneal surface. Carmine was now discarded for Berlin blue. The quantity absorbed by the peritoneum in fifteen hours was 5.35 per cent. of the body-weight.

Experiment 3.—Rabbit three pounds; a three-ounce solution, at blood-heat, containing Berlin blue, alcohol, and NaCl, was injected into the abdomen at 5.30 P.M. Rabbit in much pain shortly after injection. Killed next day at 9 A.M. Perhaps two drachms of a cloudy lymph fluid were found in the abdomen; very slight œdema; large collections of leucocytes were irregularly deposited on the peritoneal surface, especially on the centrum tendinosum. The quantity absorbed was 6.4 per cent. of the body-weight in sixteen and a half hours.

Experiment 4.—Guinea-pig's abdomen was injected with a solution containing Berlin blue, NaCl, alcohol, and water. After fifteen hours the animal was killed and all the fluid was absorbed from the peritoneal cavity. On microscopic examination many leucocytes were found on the serosa; the diaphragmatic lymphatics were found crowded with particles of Berlin blue. The quantity absorbed by the peritoneum in fifteen hours was 5 to 6 per cent. of the body-weight. In the above four experiments the microscope demonstrated colored granules in the diaphragmatic lymphatics. The centrum tendinosum and other parts of the peritoneum were treated with silver nitrate, and brushed to remove the endothelia so that the subendothelial lymphatics were plainly visible.

Experiment 5.—Rabbit about two and a half pounds; injected about three ounces of a solution containing H_2O, C_2, H_6O, NaCl, and Berlin blue into the abdomen and killed the animal fifteen hours later. On opening the abdomen all fluids were absorbed. On microscopic examination the diaphragmatic lymphatics were found crowded with Berlin blue; immense numbers of leucocytes swarmed out on the diaphragmatic serosa. On examination of many parts of the peritoneum no colored granules could be seen except in the diaphragm. The quantity absorbed by the peritoneum in fifteen hours was about 7 per cent. of the body-weight.

Experiment 6.—Rabbit; female; weight, 700 grammes; with trochar and canula. Fifty cubic centimetres of water, at body temperature, was injected into the abdominal cavity; sufficient Berlin blue was added to make the liquid a light-blue color. The liquid was allowed to remain in the cavity forty minutes. The rabbit was killed by a stroke on the back of the head. The rabbit appeared in great pain after the injection and was restless most of the time. On being killed and the abdomen opened by a two-inch incision all the fluid was carefully drawn out with a syringe, which was about three cubic centimetres. Allowing a liberal waste while injecting and the flowing from the punctured wound as three cubic centimetres, it allows thirty-nine cubic centimetres absorbed in forty minutes. With open lymphatics the quantity absorbed, while alive, in forty minutes was thirty-nine cubic centimetres, 5.5 per cent. of the body-weight.

Experiment 7.—Same rabbit, dead. Abdomen being opened and all fluids being drawn out of the cavity, we injected fifty cubic centimetres of water at body temperature, and closed the abdomen hermetically with double rows of strong sutures. After forty minutes abdomen was reopened and the fluid carefully drawn out with a syringe; about ten cubic centimetres of a cloudy-appearing fluid were collected. About thirty-nine cubic centimetres were absorbed by all the peritoneum of the dead rabbit, and that, too, after it had during life absorbed thirty-nine cubic centimetres ten minutes before; so that here it could be estimated that the dead peritoneum absorbed more than the living one. During ninety minutes seventy-eight cubic centimetres were absorbed with ten minutes' interval of rest. With open lymphatics the quantity absorbed in forty minutes, while dead, was thirty-nine cubic centimetres, 5.5 per cent. of the body-weight.

However, we can hardly consider the diaphragm dead until three or four hours after cessation of heart-beat and respiration. Peritoneal absorption of fluids cannot be considered a vital process, but a purely mechanical process. One should be careful in introducing the fluid, as it is very easy to wound the intestines. One of the best methods is to introduce a trochar and canula, then withdraw the trochar when the point of the canula can be moved freely about in the abdominal cavity without injury to the viscera. The rabbit lay on its back all the time, except one and a half minutes to kill it and one and a half minutes to weigh it, for it is known that hanging the animal up by the hind limbs hastens the peritoneal absorption and as well as elevating the hips,—all hastening the approach of fluids towards the diaphragm, which is the chief locality of absorption. The rabbit's abdomen was not massaged, for that hastens peritoneal absorption and lymph (duct) secretion.

Microscopical Examination.—The gastro-splenic omentum and the centrum tendinosum were examined. The Berlin blue was found in the intertendinous spaces, often in large clumps; the leucocytes swarmed out on the diaphragmatic surface. Some contained particles of Berlin blue inside of their bodies; the centrum tendinosum was œdematous, all fibrous bundles being well and abnormally separated from each other by fluids,—*i.e.*, the intertendinous lymph-spaces were dilated.

The gastro-splenic omentum did not show an especial share in the experiment. No particles of Berlin blue could be found in its lymphatics nor could œdema be distinctly observed.

There was a defect in this specimen, owing to treatment. The diaphragm was brushed too vigorously, and then it was placed in a bottle and shaken too much by a journey. The defect lies in being too much brushed and too much washed. But the deposit of Berlin blue in the intertendinous lymph-spaces was distinct.

In 1889 and 1890, in experimenting on dogs to perfect a technique in intestinal surgery, I often poured the dog's abdomen full of warm water to test its effect on the animal. The only effect I observed was that the dog urinated very frequently and in abnormally large quantities for some fifty hours, so that the disappearance of the fluids from the peritoneum has long been known from ancient and modern experiments. But the paths of absorption, whether it be by way of the lymphatics or the blood-vessels, remain unsettled to-day.

Experiment 8.—Rabbit; female; weight 1000 grammes. Injected fifty cubic centimetres of 0.5-per-cent. NaCl, two cubic centimetres of a 5-per-cent. solution of potassium ferrocyanide with a little Berlin blue. About eight minutes later, by pressing on the bladder, urine was forced out, and by adding ferric chloride a faint-blue reaction arose. In twenty minutes after the injection into the abdomen the urine gave a deep blue, and forty minutes after the injection the urine was of a very dark blue by adding the iron and salt. By adding the iron and salt to the urine a fine blue color arises if any potassium ferrocyanide be present, even in extremely small quantities. At the end of forty minutes the rabbit was killed, the abdomen was opened, and eight cubic centimetres of fluid drawn out with the syringe. Allowing a liberal waste of five cubic centimetres, it would leave about thirty-seven cubic centimetres which the rabbit of 1000 grammes absorbed in forty minutes. The quantity absorbed in forty minutes, while alive, was thirty-seven cubic centimetres, 3.7 per cent. of the body-weight. With free lymphatics fluids pass from the peritoneum into the bladder in eight minutes.

Experiment 9.—Same rabbit, dead. Injected into the abdominal cavity fifty cubic centimetres of 5-per-cent. NaCl solution at blood-heat, and sewed up the abdomen with the rabbit lying on its back. In forty minutes I reopened the abdomen and drew off twenty centimetres with a syringe. Allowing a liberal waste, while dead, in forty minutes, the peritoneum absorbed twenty-eight cubic centimetres, 2.88 per cent. of the body-weight.

In the preceding experiment observe that a 700-gramme rabbit absorbed more than this 1000-gramme rabbit, both dead and alive.

Microscopical Examination.—The microscope showed that the Berlin blue was thickly and richly deposited in the intertendinous lymph-spaces of the diaphragm. One can easily observe the colored granules between the tendons irregularly deposited. Leucocytes can be seen clamped between the borders of the cover-plates emerging from a stoma verum. They can be observed shimmering through the transparent endothelium as they are approaching a stoma verum or spurium. The particles of Berlin blue can be seen numerously deposited in the wide capillary lymph-channels or spaces through both the free peritoneal and lymph vascular endothelia; but very few places can be found where the blue particles can be seen entirely surrounded by the leucocytes; perhaps the time, forty minutes, was too short for the process to complete itself. But in many places the leucocytes can only be found in contact with the particles of Berlin blue,—*i.e.*, partially surrounding it.

Experiment 10.—Rabbit; weight, 1050 grammes. Anæsthetic chloroform; left jugular vein ligated; fifty cubic centimetres (of H_2O, forty-eight parts and two cubic centimetres of a 5-per-cent. solution of potassium ferrocyanide), at blood-heat, was injected into the peritoneal cavity. He suddenly died eleven minutes later from the chloroform. Re-collected after opening the abdomen, twenty cubic centimetres; thirty cubic centimetres absorbed in eleven minutes.

With ligated lymphatics, while alive, the peritoneum in eleven minutes absorbed thirty cubic centimetres, 2.8 per cent. of the body-weight. With ligated lymphatics, while dead, the peritoneum in eleven minutes absorbed twenty-eight cubic centimetres, 2.6 per cent. of the body-weight. (No reaction in the urine from the addition of iron salts in eleven minutes with ligated lymphatics.)

Experiment 11.—The same rabbit, dead. Fifty cubic centimetres of H_2O at blood-heat was now poured into the dead rabbit's abdomen and the cavity closed by sutures. Berlin blue was added to color. In eleven minutes rabbit's abdomen again opened and collected twenty-two cubic centimetres; absorbed twenty-eight cubic centimetres. The abdominal peritoneum gave a quick reaction to the iron salt after eleven minutes, but no reaction could be gained by introducing cotton into the thoracic cavity wet with iron salt; hence the solution of ferrocyanide had not gained the bladder or the pleural cavity in eleven minutes, nor even ten minutes later, when it was again tested. With the left jugular vein ligated the cyanide salt had not gained the bladder in eleven minutes, as shown by testing, while with the jugular vein not ligated the cyanide salt gains the bladder in seven to eight minutes.

This rabbit of 1050 grammes showed rapid absorption, absorbing during life in eleven minutes thirty cubic centimetres, and after death twenty-eight cubic centimetres in eleven minutes, with the left jugular vein ligated.

Microscopically.—In eleven minutes after death the particles of Berlin blue gained the lumen of the lymph-vessels of the subendothelia of the diaphragm. They are chiefly found in the interstitial lymph-spaces lying between the tendon bundles of the centrum tendinosum. They are mainly found along the wall of the large-valved lymph-trunks, occasionally towards the centre inside of a leucocyte, in contact with a leucocyte, or free.

Experiment 12.—Human diaphragm, two and a half years old; male. Thirty-six hours after death absorbs Berlin blue particles by being placed in water with Berlin blue in it. The Berlin blue particles are found between the tendons, and more plenty in the large branches of lymph-vessels which lie along the circumference of the centrum tendinosum. The colored granules are not so richly deposited in the lymph-vessels of the dead as in the living, as the pumping action of the dead diaphragm is lost. A diaphragm which absorbs thirty-six hours after death must depend on some other factor than so-called "vital" action. The process of diaphragmatic absorption must rest on some mechanical principle, perhaps due to the perforations of the membrana limitans, which are almost solely located on the centrum tendinosum.

Experiment 13.—Dog of about six pounds. Anæsthetized and the left jugular vein ligated; injected into the peritoneal cavity one hundred cubic centimetres of fluid (H_2O ninety-eight cubic centimetres and two cubic centimetres) of a 5-per-cent. solution of K ferrocyanide. He suddenly died in 11 minutes from the chloroform, and the fluid was removed; absorbed fifty cubic centimetres.

Experiment 14.—Same dog, dead. Abdomen opened; one hundred cubic centimetres H_2O injected (with Berlin blue) and re-collected in eleven minutes. Twenty cubic centimetres absorbed; in eleven minutes no reaction of the urine by Fe_2Cl_6.

In the very short experiments the leucocytes do not emerge on the diaphragmatic surface in such swarms as they do in the experiments of longer duration. However, in the two experiments, one of forty minutes alive and forty minutes dead, one may observe in specimens treated with this solution (of water and acetic acid, 1 to 200, and of this mixture 1000 parts, and gold chloride one part) the most beautiful examples of the leucocytes attempting to emerge through a stoma verum or spurium. Also one can observe the leucocytes on the under side of the cover-plate.

Microscopically.—The Berlin blue gained the diaphragmatic lymphatics in eleven minutes, though dead, without diaphragmatic motion. With ligated lymphatics, while alive, in eleven minutes the peritoneum absorbed fifty cubic centimetres (8.8 per cent. of the body-weight). With ligated lymphatics, while dead, in eleven minutes the peritoneum absorbed twenty cubic centimetres, 2.2 per cent. of the body-weight.

Experiment 15.—Duration of experiment thirty minutes. Dog weighed about twenty pounds; chloroformed almost continuously with ligated left innominate vein; injected one hundred cubic centimetres into peritoneal cavity (H_2O ninety-eight cubic centimetres plus two cubic centimetres of 5-per-cent. solution potassium ferrocyanide). Killed by chloroform in thirty minutes; eighty cubic centimetres absorbed. Tests for urine every five, ten, and twenty-five minutes, but no reaction of blue in the urine by adding for coloring Fe_2Cl_6. No blue color in the urine in thirty minutes with ligated lymphatics.

Experiment 16.—Same dog, dead. Injected one hundred cubic centimetres H_2O with sufficient Berlin blue for coloring. In thirty minutes seventy cubic centimetres absorbed; at the end of one hour and ten minutes after the first injection the urine reacted deep blue, and the peritoneal cavity reacted blue, but the pleuræ did not react blue.

Microscopically.—I examined a few specimens only of the diaphragm, but did not secure good points showing the Berlin blue. The diaphragm appeared blue to the naked eye in between the tendons. With ligated lymphatics while alive the peritoneum in thirty minutes absorbed eighty cubic centimetres, 1.06 per cent. of the body-weight. With ligated lymphatics, while dead, the peritoneum absorbed in thirty minutes seventy cubic centimetres, 0.93 per cent. of the body-weight.

Experiment 17.—Rabbit; male; weight, 952 grammes. Left innominate vein ligated; injected into abdomen fifty cubic centimetres of a 1-per-cent. NaCl solution at blood-heat (with two cubic centimetres of a 5-per-cent. solution of potassium ferrocyanide with sufficient Berlin blue for coloring). Duration of experiment thirty minutes; urine tested every five minutes after the first seven minutes. The first delicate blue reaction occurred at the end of thirty minutes. All fluid collected. Absorbed eight cubic centimetres. Rabbit killed with ether.

Experiment 18.—Same rabbit, dead. Fifty cubic centimetres at blood-heat of a 1-per-cent. solution of NaCl was injected into the abdomen and the abdomen closed by sutures. At the end of thirty minutes the fluid was again collected, amounting to sixteen cubic centimetres; absorbed thirty-four cubic centimetres. By close examination after death I found that I had included in the ligation of the left innominate vein the carotid artery, the pneumogastric and the phrenic nerve.

Microscopically.—The Berlin blue which was added to the experiment while the animal was living was found beautifully deposited in the centrum tendinosum.

With ligated lymphatics, while living, the peritoneum absorbed eight cubic centimetres in thirty minutes, 0.88 per cent. of the body-weight.

With ligated lymphatics, while dead, the peritoneum absorbed in thirty minutes thirty-four cubic centimetres, 3.57 per cent. of the body-weight. The blue color appeared in the urine in thirty minutes, proved by pressing on the bladder, forcing out the urine, and adding the Fe_2Cl_6.

Experiment 19.—Dog; female; weighed about seven pounds. Anæsthetized with chloroform; left innominate vein ligated; injected into the abdomen at blood-heat one hundred cubic centimetres of a solution (H_2O, forty-eight cubic centimetres, two cubic centimetres of a 5-per-cent. solution of potassium ferrocyanide). In five, ten, and fifteen minutes after the injection the urine was pressed out of the vagina, but gave no reaction to the ferric salt. No reaction could be gained until the animal was killed thirty minutes after the injection into the peritoneal cavity. At death, the bladder being opened, the urine gave a pale blue reaction. Ninety-five cubic centimetres were absorbed in thirty minutes. A blue reaction could be secured over the peritoneal cavity, but none in the pleural cavities. With ligated lymphatics the first blue color appeared in the urine in thirty minutes.

Experiment 20.—Same dog, dead. One hundred cubic centimetres of a watery solution of Berlin blue at blood-heat was injected into the peritoneal cavity and the abdomen was closed with sutures. In thirty minutes fifty-five cubic centimetres were absorbed; no œdema could be observed. The Berlin blue could be seen by the naked eye filling the intertendinous lymph-spaces of the centrum tendinosum.

The microscope showed not only the intertendinous spaces loaded with blue particles by the large lymph-vessels of the diaphragm, but also the lymph-vessels of the gastro-splenic omentum. So far I have not found the blue granules in the mesentery, but we have found the colored granules in the centrum tendinosum, the gastro-hepatic and gastro-splenic omentum, and in the vast lymphatic beds in the peritoneum around the pylorus. Also we found them in the lymphatics of the ligamentum latum.

With ligated lymphatics, while alive, the peritoneum in thirty minutes absorbed ninety-five cubic centimetres, 3.63 per cent. of the body-weight.

With ligated lymphatics, while dead, the peritoneum in thirty minutes absorbed fifty-five cubic centimetres, 2.1 per cent. of the body-weight.

Experiment 21.—Dog; male; weighed nine pounds; chloroformed and left innominate vein ligated. One hundred cubic centimetres of a solution of ninety-eight cubic centimetres of H_2O, plus two cubic centimetres of a 5-per-cent. solution of potassium ferrocyanide, plus sufficient NaCl to make a 1-per-cent. NaCl solution was injected at 2.25. Ten minutes later, at 2.35, 100 cubic centimetres more of the same solution were injected. Five minutes later —*i.e.*, fifteen minutes after the first injection—the dog suddenly died from the chloroform. No reaction could be gained from the urine by the addition of the ferric salt, though tested every five minutes. By testing the pleural cavity no reaction of the blue color appeared. In fifteen minutes 100 cubic centimetres were absorbed.

With ligated lymphatics no blue reaction occurred in the urine in fifteen minutes.

With ligated lymphatics, while alive, the peritoneum in fifteen minutes absorbed 100 cubic centimetres, 3 per cent. of the body-weight.

Experiment 22.—The same dog, dead. The dog's peritoneum absorbed thirty cubic centimetres of the same kind of fluid in fifteen minutes. No œdema or peritoneal extravasation could be observed. Berlin blue was added to the solution injected into the dead animal.

Microscopically.—The diaphragm and gastro-splenic omentum did not show abundant filling of the lymphatics, but a spare quantity of Berlin blue was found in the diaphragmatic and gastro-splenic omentum.

With ligated lymphatics, while dead, the peritoneum in fifteen minutes absorbed thirty cubic centimetres, 0.9 per cent. of the body-weight.

Experiment 23.—The centrum tendinosum of the diaphragm of a man, aged twenty-eight years, dead about thirty hours from violent and universal interstitial and parenchymatous nephritis, was placed in a watery solution of Berlin blue for about five hours. It was then stained with ½ per cent. silver nitrate solution for fifteen minutes. This specimen showed most typically absorption of Berlin blue particles. The blue granules were located in the lymphatic vessels, but especially the large-valved trunks as they radiated towards the zona peritendinosa.

Experiment 24.—Diaphragm of a girl, thirteen years old, dead twenty-eight hours, was placed in a watery solution of Berlin blue for several hours, and showed, after staining with silver nitrate, absorption of the blue granules.

Microscopically.—This specimen showed beautifully the perforation of the membrana limitans of the centrum tendinosum.

Experiment 25.—Rabbit; female; weighed 1450 grammes. Left innominate and right jugular veins ligated. Injected fifty cubic centimetres (H_2O, forty-eight cubic centimetres, plus two cubic centimetres of potassium ferrocyanide of 5 per cent., plus a 1-per-cent. NaCl solution) into the abdomen. The reaction of urine was tested every five minutes. No urine reaction occurred until thirty minutes after the injection, and then only a light tint of blue. Rabbit killed with chloroform and collected twenty cubic centimetres,—absorbed thirty cubic centimetres in thirty minutes. The rabbit was allowed to wake up after the injection into the peritoneal cavity.

With ligated lymphatics, while alive, the peritoneum in thirty minutes absorbed thirty cubic centimetres, 2.06 per cent. of the body-weight.

With ligated lymphatics the blue reaction occurred in the urine in thirty minutes.

Experiment 26.—Same rabbit, dead. Injected fifty cubic centimetres of H_2O, a 1-per-cent. solution of NaCl, and sufficient Berlin blue to color the fluid. In thirty minutes fourteen cubic centimetres were collected; loss two cubic centimetres; absorbed thirty-four cubic centimetres. The proximal side of the right jugular vein was very œdematous for one inch, and a similar condition existed about the proximal side of the ligature in the innominate vein. The urine was forced out of the vagina by pressing on the bladder. No peritoneal œdema could be seen.

With ligated lymphatics, while dead, the peritoneum absorbed in thirty minutes thirty-four cubic centimetres, 2.34 per cent. of the body-weight.

Microscopically.—The colored granules are found (*a*) widely distributed into the lymphatics of the diaphragm; (*b*) the lymphatics of the gastro-splenic omentum; (*c*) in the lymphatics of the broad ligaments.

This specimen was a good sample to prove that Schweigger-Seidel was in error when he stated that washing the peritoneal membrane would prevent the interendothelial lines from arising on the application of silver nitrate. This specimen was placed in a bottle of distilled water and put in my pocket and carried a mile on a bicycle, when it was found that the silver nitrate called up the interendothelial lines, yet some were very faint.

Experiment 27.—Dog; male; weighed eight pounds. Anæsthetized with chloroform; right and left innominate veins ligated; duration of the experiment thirty minutes. 2.03, 100 cubic centimetres, 2-per-cent. NaCl solution and two cubic centimetres, 5-per-cent. potassium ferrocyanide; 2.22, no blue in urine; 2.28, slight tinge in urine; 2.33, decided blue reaction; dog killed with chloroform. Recovered from dog's peritoneal cavity thirty cubic centimetres in excess of injection,—*i.e.*, 130 cubic centimetres; thirty cubic centimetres was added to the injected fluid. Nothing abnormal observed. The 2-per-cent. NaCl solution was hypertonic.

With ligated lymphatics, while alive, the peritoneum in thirty minutes was found to have gained thirty cubic centimetres. The NaCl solution (2 per cent.) was hypertonic, and hence the fluids followed the law of osmosis.

Experiment 28.—Same dog, dead. 2.43, 100 cubic centimetres injected of Berlin blue and H_2O; 3.13, recovered seventy-five cubic centimetres; absorbed twenty-five cubic centimetres. No blue reaction in chest cavity one hour after first injection. The urine was pressed out of the bladder and tested with ferric chloride. As the dog had a full stomach and intestines, one would consider the intra-abdominal pressure even higher than a normal dog. But the NaCl solution was 2 per cent.,—*i.e.*, hypertonic.

With ligated lymphatics, while dead, the peritoneum in thirty minutes absorbed twenty-five cubic centimetres of water, 0.83 per cent. of the body-weight.

Microscopically.—This dog showed nothing abnormal except the small amount of Berlin blue found in the centrum tendinosum. But the particles of Berlin blue were distinctly deposited in the omentum about the pylorus where a rich net-work of lymphatics exists.

Experiment 29.—Rabbit; female; weighed 713 grammes. Both innominate veins ligated. Injected into the abdominal cavity 100 cubic centimetres of 2 per cent. NaCl, plus two cubic centimetres of a 5-per-cent. solution of potassium ferrocyanide, plus H_2O. Rabbit allowed to wake up partially. A blue color appeared in the urine twenty-five minutes after the peritoneal injection. Killed in thirty minutes after the injection. Recovered fifteen cubic centimetres, lost ten cubic centimetres, absorbed seventy-five cubic centimetres.

With ligated lymphatics, while alive, the peritoneum in thirty minutes absorbed seventy-five cubic centimetres, 10 per cent. of the body-weight.

With ligated lymphatics the blue reaction appeared in the urine in twenty-five minutes.

Experiment 30.—The same rabbit, dead, was injected with 100 cubic centimetres of same solution, except the ferrocyanide, a little Berlin blue was added to mark the lymphatics. In thirty minutes the dead rabbit's peritoneum absorbed fifty-seven cubic centimetres, forty-three cubic centimetres were recovered. The standard of absorption of the same animal, with completely ligated lymphatics, dead or living, is relatively the same. With ligated lymphatics, while dead, in thirty minutes the peritoneum absorbed fifty-seven cubic centimetres, 0.8 per cent. of the body-weight.

CONTRIBUTION TO THE SURGERY OF THE LARGE INTESTINE.

By JOHN WHEELOCK ELLIOT, M.D.,

OF BOSTON,

SURGEON TO THE MASSACHUSETTS GENERAL HOSPITAL.

I WAS recently accidentally led to resect a cancerous growth of the ascending colon through a lumbar incision. So far as I can learn, it is a new operation, and I found it a satisfactory one.

The incision was along the outer border of the quadratus lumborum, and curving forward towards the anterior spine of the ilium. The bowel was easily drawn out and resected. The cut ends lay entirely outside the body, so that there was absolutely no fear of infecting the peritoneal cavity from the intestinal contents. When the bowel was returned it lay in a perfect position for drainage. The following is a detailed account of the case:

CASE I.—*Resection of the Colon by a Lumbar Incision.*—The patient, a single woman, aged forty-one years, entered the Massachusetts General Hospital in March, 1896. She was at first admitted into the medical ward, where a diagnosis of movable kidney was made, and she was accordingly sent to the surgical ward for the operation of nephrorrhaphy.

History.—Although previously well, for the past three years she had had attacks of abdominal pain, paroxysmal in character, lasting for only a brief period, recurring every fifteen minutes or so for several days, or perhaps with a week's interval. Two years previous to entrance she had noticed a lump in the right side, which was tender and quite movable at first, but less so of late. She complained of dragging backaches and occasional nausea. During the last month she had had several attacks of severe pain in the right iliac fossa with vomiting. She had lost fifteen pounds in weight during the last two years. Bowels regular.

Examination.—Patient well-developed and fairly well nourished. In the right side of the abdomen there was a movable tumor, tender, and of about the size and consistency of the kidney. It could be palpated bimanually and moved about with freedom. The diagnosis of movable kidney was concurred in.

Operation.—On March 16 the kidney was exposed by the usual incision for nephrorrhaphy. It was found to be in its normal place, but a movable nodular tumor was felt in the peritoneal cavity. The incision was then extended forward towards the anterior superior spine of ilium. The peritoneal cavity being opened the tumor was found to be in the wall of the ascending colon. All the walls of the colon were involved for about two inches except the peritoneal covering, which was apparently free. There was no ulceration and only a slight diminution in the calibre of the intestine. Three inches of the colon was cut away, including the tumor, and leaving a margin of healthy bowel. An enlarged gland was removed from the mesocolon. The cut ends were united with a Murphy button, and a continuous silk suture closed the peritoneal surfaces outside the button. The colon was replaced and gauze packed down to the intestinal suture.

The patient bore the operation well and made a good recovery. On the fourth day there were evidences of a moderate infection of the loose subperitoneal fat tissue, but this cleared up quickly when dressed with iodoform gauze.

The abdomen remained soft and no tenderness or swelling could be felt over the resected colon. The temperature remained at about 100° F. for ten days, but on the thirteenth day it rose to 103° F., and immediately fell to normal and remained there. This rise of temperature gave us some anxiety as to the amount of sloughing the Murphy button might cause, and I have no doubt that the sudden rise to 103° F. was due to the separation of the button. The button was passed on the twenty-fifth day. The growth proved to be an adenocarcinoma.

The patient was known to be well three months after the operation.

CASE II.—*Bullet-Wound of the Colon.*—The patient, a man, twenty-seven years old, was brought to the Massachusetts General Hospital on March 23, 1896, one hour after being shot in the abdomen. He was moderately well nourished, pale, and in considerable shock. Pulse 80; temperature 99° F.

The abdomen was not distended and not particularly tender anywhere. There was a bullet-wound on the left side of the abdomen at about the border of the rectus muscle and below the cartilage of the eighth rib. The wound of exit was in the left lumbar region, about on a line with the tip of the twelfth rib and four or five inches from the spine. There was also a bullet-wound of the thigh and a scalp wound. The patient was conscious and having some pain. He had vomited, but there was no blood in the vomitus.

Operation, in the night, about one and a half hours after the shooting. Incision parallel to the costal cartilage, with wound of entrance at its centre. Free blood found in the peritoneal cavity. Incision enlarged downward in linea semilunaris to below umbilicus eight inches in length. About a quart and a half of blood were sponged out. One bullet-hole was found in the descending colon just opposite the mesentery; surrounding this opening for some distance was an area of subserous extravasation of blood. Apparently there was no extravasation of fæces through the wound. This was closed with Lembert sutures. No wound of exit was found in the intestine, the bullet having passed into the mesocolon. The wound of exit in the loin was now explored by an incision four inches long down to a bleeding point just below the kidney and to the extraperitoneal portion of the colon. A gauze packing inserted through this opening controlled the bleeding. A gauze wick was also inserted in front down to the sutures in the colon and the abdomen closed.

The patient bore the operation well, but three days later the abdomen became distended so that the silkworm-gut stitches, which were defective, gave way, and the omentum protruded from the wound. Chloroform was given and the wound wholly reopened. The gauze pack was removed and the wound in colon found to be healthy. The abdominal wound was again closed tight. The bowels were moved the next day, and the abdomen became flat and soft. From that time there was an uninterrupted recovery. Stitches removed on the twelfth day. Patient sat up on the twenty-fourth day and was discharged in thirty-one days.

Case III.—*Stab-Wound of the Colon.*—The patient, a man, forty-two years old, was brought to the Massachusetts General Hospital March 31, 1896, half an hour after being stabbed in the abdomen.

He had but little pain and was in good condition. Pulse 112.

The abdomen was soft, not tender, with no dulness or distention. Protruding from a wound one-half an inch in length, one-half an inch below the left anterior superior spine of ilium, extending towards the median line, was a piece of omentum the size of a plum. There was no external bleeding. The urine was clear.

On enlarging the wound in the abdomen blood welled up from the pelvis. A subperitoneal extravasation of blood was found behind the lower portion of the descending colon. This was laid open and several large vessels tied. The knife had penetrated the serous coat of the colon, but had glanced from the muscular layer, cutting the vessels in the mesocolon without penetrating the bowel. To make certain that the bowel was strong, it was filled with water from below, but it stood the strain.

A gauze drain was packed down to the injured bowel and the abdominal wound partially closed. On the third day the omentum protruded and was replaced. On the sixth day chloroform was given, the gauze removed, and the wound closed tight with silver wire sutures. This healed by first intention, and the patient was discharged well in twenty-eight days.

CASES OF RUPTURE OF THE QUADRICEPS EXTENSOR TENDON TREATED BY SUTURE.

By ANDREW J. McCOSH, M.D.,

OF NEW YORK CITY.

A RUPTURE of the quadriceps extensor tendon is not a rare accident, neither should its diagnosis be difficult, and yet from a perusal of reported histories of such cases the impression is received that in many of them the injury was overlooked, because the examining physician was not alive to the possibilities of such an accident. In these cases it is of the utmost importance that appropriate treatment should be at once begun. What treatment shall be adopted? Shall it be rest in bed with the elevation of the limb, etc., or shall it be an operation for suture of the divided tendon? There are certainly many cases where surgical treatment is not needed, but, on the other hand, in the majority of cases when complete rupture has occurred, either above or below the patella, the results from non-operative treatment are far from satisfactory. This is especially so when the rupture is above the patella. In forty such cases, collected by Maydl, there was complete recovery in 60 per cent. only, and in the twenty-three cases collected by J. B. Walker in 70 per cent. Contrast with this the final result after suture in the twenty-one cases collected by Walker with complete recovery in 90 per cent. Such operations, however, are not devoid of risk, and while so far no disastrous results have followed it must not be forgotten that the majority of these patients have been under the care of surgeons of skill and experience. It is only by such men that the operation should be attempted, and if the proper conditions for an aseptic operation do not exist, it is probably wiser to adopt, for a time at least, a non-operative plan of treatment.

Should this fail, the suture can be done at some later date, when the surroundings are more favorable for a successful issue.

When shall the operation be performed?

The most favorable time is probably at the expiration of five or six days after the injury, when the acute stage of the joint hyperæmia has subsided. While a delay of several weeks does not seem to be advisable, yet it does not contraindicate the operation. In the three operations here recorded, a delay of eight weeks in the first case did not interfere with a perfect recovery; while in the second case a similar delay seemed to influence in a slight degree the final result.

Case I.—M. McG., aged nineteen years, admitted March 15, 1894. Seven weeks ago fell down a flight of stairs, the left knee being forcibly hyperflexed under him. He was able to walk home. On the following day the knee became swollen and painful. He sought treatment in a dispensary where the diagnosis of sprain of the knee was made. After this he walked to the dispensary twice weekly for treatment, which consisted of a bandage and counter-irritation. Unable to work on account of pain and disability. On examination there was found to be complete separation of the quadriceps extensor tendon from the superior border of the left patella, the distance being one and a half inches. Two fingers pressed into this space could clearly feel the anterior surface of the trochlea and the condyles of the femur. Flexion at knee unimpaired, but almost complete loss of extension. Slight swelling and tenderness of joint. End of tendon felt to be thickened.

Operation March 20: fifty-five days after accident; ether. Vertical incision, six inches long, at once entered the joint and exposed the lower part of the tendon and the patella. End of tendon decidedly thickened and hard as if there had been a deposit of bone. The ragged and hardened end of the tendon trimmed off, as likewise border of the patella. The tendon had been torn directly from its point of attachment to the bone, probably pulling off with it some of the periosteum, so that no part of the tendon remained attached to the patella. The lateral expansions, however, were only partially torn off. Joint contained a few small partially-organized blood-clots and some fluid, but was comparatively clean. Irrigation with hot salt solution. Three small openings were drilled through the upper end of the patella, into which and then through the entire thickness of the tendon were passed silkworm-gut sutures. Synovial membrane and the lacerated portions of the lateral expansions sutured with catgut, silkworm sutures tied, and incision closed by silk sutures without drainage. Plaster-of-Paris splint, the limb being hyperextended. On the following day considerable pain. April 6, temperature has not reached 100° F. since operation; splint removed; primary union; sutures removed; patella freely movable laterally; new splint.

April 23: fenestrum cut in splint and daily massage. Patient out of bed May 5; splint removed; passive motion; a few adhesions felt to snap. May 23: discharged cured. No stiffness; rapidly regaining power of extension. May, 1896: Reports that one leg is as good as the other; no disability; no pain; extension and flexion perfect.

CASE II.—*Rupture of Quadriceps Extensor Tendon of each Knee.*—C. J. K., aged fifty-two years. A short, heavy man, who has always been an awkward walker, fell down stairs on June 17, 1896, the right knee being flexed under him; felt something break, but was able to rise and walk. Injury followed by some pain and swelling. His physician called it a sprained knee. Patient able with great effort to attend to his business as clerk, walking with the aid of crutches. On July 17, while hurrying to cross the street, fell and felt a snap in his left knee. He could not rise. With assistance he was helped to a carriage and taken home. Admitted to hospital on July 18. On examination is felt a depression, admitting two fingers between the superior border of the patella and the end of the quadriceps extensor tendon. Between these was felt distinctly the trochlea of the femur. Considerable swelling of knee; slight tenderness; flexion good, but extension absolutely lost. Examination of right knee reveals a similar condition, though with more exudation in the joint.

Operation July 23; ether. A curvilinear incision, concavity downward, was made across the left limb about one and a half inches above the superior border of the patella and directly over the end of the tendon; tissues œdematous and infiltrated with blood. Joint at once opened and found filled with blood-clots, shreds of tissue, and synovial fluid. Irrigated with salt solution. Rupture through the tendon found to be a transverse one for the most part, about half an inch above its point of attachment to the patella, the tear being ragged, a strip some three inches long having been torn from the anterior layer of the tendon and remaining attached to the patella. The lateral expansions were almost completely torn off, small shreds being left attached to the sides of the bone; the gap between the patella and the end of the tendon measured one and a half inches; persistent irrigation needed to remove the clots and shreds of tendon; ends of tendon trimmed off by scissors, the tongue-shaped strip being removed with the exception of a half inch at its base. After the trimming there remained one-third of an inch of tendon attached to the patella; a double strand of silk was then passed through each end of the entire thickness of the tendon and at the patellar attachment through the edge of the bone itself; a suture of chromicized catgut was then passed on each side of the silk suture through the tendon, but without piercing the bone.

After thorough irrigation the lateral and anterior expansions were united by catgut sutures and the three tendon sutures tied. The fascia was united by catgut and the skin by silk sutures; no drainage. As a result of the curved incision the line of skin union was situated one inch superior to the line of union in the tendon.

Right.—A similar incision opened directly into the joint, which was filled with blood-clots and synovial fluid. The rupture of the tendon was a transverse one directly at its point of attachment to the patella. Laceration of the lateral expansions less extensive than in the left joint. Separation between superior border of patella and end of tendon one inch and a quarter. End of tendon trimmed off and border of bone freshened. As no part of the tendon had been left attached to the patella, a hole was drilled through the upper part of the bone and a double strand of silk passed through this and through the end of the tendon. Suturing completed as on left side. Considerable force was needed to approximate the end of the tendon to the patella. Plaster-of-Paris splint from ankles to upper part of thighs; for forty-eight hours considerable pain; afterwards patient comfortable; temperature never rose to 100° F.

August 6: fenestrum cut in splint; primary union; sutures removed; patella movable laterally, the right less freely than the left. August 12: massage to each knee daily. August 18: splints removed; passive motion ordered; comfortable flexion to fifty degrees in each knee. August 25: walks about with aid of crutches; flexion of right knee somewhat limited.

September 2: discharged cured; walks unaided; flexion and extension of left knee perfect; flexion of right to 90 degrees only; extension perfect.

November 15: patient walks almost as well as ever; slight limitation to flexion of right knee; flexion and extension of left knee perfect.

TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, December 9, 1896.

The President, Frank Hartley, M.D., in the Chair.

ŒSOPHAGEAL STRICTURE.

Dr. Robert Abbe presented a child three years old with the following history: A year and a half ago it had swallowed a cup of lye, which produced the usual acute traumatism of the œsophagus, followed by stricture. A year ago a surgeon, finding the stricture impermeable from above, performed gastrostomy and dilated the stricture to a moderate extent by simple use of bougies from below. After a few months the child passed from his care still having a gastric fistula, but swallowing soft food, and about a month ago was taken back to the surgeon, who was then unable to pass any bougie. The patient was then brought to Dr. Abbe, and he, too, was utterly unable to pass any instrument from above. The child was very much emaciated. The irritability of the stomach was such that with every administration of food through the large fistula, which would admit the ends of three fingers, spasmodic contraction would cause eversion of the mucous membrane, so that a considerable portion of stomach everted and formed a large hernia, frequently requiring surgical aid to reduce it. Finding the child wasting very fast, Dr. Abbe carried out reverse dilatation under ether; after the stricture yielded to a certain point bougies could not be pushed farther through the stricture. He then tried the string method which he had described on former occasions, and with entire success. While the stricture was put well on the stretch by a small bougie (the largest which could be made to enter) a heavy braid of silk string was drawn back and forth several times. After this the bougie advanced with great facility, and soon a size was passed as large as was normal for a child of that age. The patient was allowed to swallow and take its full quota of food next day, and it has since rapidly gained in weight.

Dr. Abbe also called attention to the healed abdominal wall, closure having been effected by dissecting the stomach from the adominal wall, inverting the edges of the fistula by buried layers of Halsted's sutures.

SARCOMA OF KIDNEY; NEPHRECTOMY; RECURRENCE AFTER FOUR YEARS AND NINE MONTHS IN THE OTHER KIDNEY.

Dr. Abbe presented a second patient, a child whom he had shown several times previously with non-recurrence of sarcoma after nephrectomy for that disease performed nearly five years ago. The child was seen by him a few weeks ago and was in perfect health, with no recurrence of disease. One month ago he found enlargement of the remaining kidney, and since then its size has doubled. The child was passing only about a spoonful of urine a day and was somewhat apathetic.

Why the disease should recur in the other kidney, he was unable to say. One would suppose it would choose the mesentery or structures in the median portion of the abdomen. The other case which he had reported at the same time as this one was free from recurrence (five years after operation) when last seen.

Dr. W. B. Coley said that he had shown a case before the Surgical Society in October, 1894, of successful abdominal nephrectomy for large sarcoma of the right kidney. At the time of the report the patient was in good condition, two or three months after the operation. Seven months after the operation there was recurrence on the same side, probably in the retroperitoneal glands; the tumor grew with great rapidity and the patient died within a year of the time of the operation. He had hoped Dr. Abbe's case might not have recurrence, and thus prove that cure was possible in sarcoma of the kidney notwithstanding the fact that previous records had pointed the other way. Lotheissen, in a recent monograph on surgery of the kidney (*Archiv für klinische Chirurgie*, No. 4, p. 721), had reported ten cases of malignant tumors of the kidneys, with a mortality of 27.27 per cent. Five were sarcoma, four adenocarcinoma, two struma. Two cases only were alive at the time of the report,—one, adenocarcinoma, was well two years and eight months. One, adenocarcinoma, was well thirteen months. Not a single case of sarcoma was living. As a matter of fact, the cases which had lived long enough to be classed as cures were *very* few in number, still, in such a hopeless condition he believed the operation was justifiable.

ANGIOMA OF ENTIRE UPPER EXTREMITY.

Dr. Abbe presented a young man, whom he had first shown eight or nine years ago, with an enormous angioma of the right upper extremity, extending from the root of the neck to finger-tips. He had lost sight of the patient for the past six years until a week ago, when he returned and stated that in the night he had scratched his shoulder, which resulted in profuse hæmorrhage. The skin in this region covering the net-work of dilated capillaries and vessels was extremely thin, and the slightest scratch was liable to cause fatal hæmorrhage. Dr. Abbe had previously shown the patient in illustration of what could be done for the improvement of such cases by the various methods then in vogue.

It is of interest to note the result of various methods of treatment after the lapse of eight years. It may be said that,—

(1) Ignipuncture with a small needle, repeated at hundreds of points, had produced but little effect on the enormous mass.

(2) The Paquelin point puncture had produced little more than the former.

(3) Section of large areas by subcutaneous loops of platinum wire, cutting through by electric heating, produced moderate control; moderate cicatrization.

(4) The use of Roser's method, suggested to him by Professor Esmarch, while witnessing the platinum wire section, was adopted and fully tested during several months on many parts of the angioma with little or no benefit. It consisted in passing many parallel heavy silk threads, steeped in styptic iron and dried, which were left in usually for a week. The cicatricial tracts thus produced did not seem materially to have reduced the tumor.

(5) Excision of a large portion near the elbow with subsequent cicatrization had affected the best results in that part, although cicatrization was very tedious, due to the quality of granulation.

It had been originally a small birthmark on the middle finger, and had grown to its present enormous dimensions.

RELAPSING INGUINAL HERNIA.

Dr. F. Tilden Brown presented a man, forty-seven years of age, who had previously submitted to four operations for inguinal hernia. According to his story, sepsis followed the first operation and the sutures gave way. In the second operation wound-soiling again occurred. His history of the third and fourth operations is vague; but the patient admits that he was guilty of some indiscretion or disobedience through ignorance or necessity after each of these operations. When he presented himself at the Presbyterian Hospital, in September, 1896, there was a mass, the size of half a cocoanut, protruding through the ring which would admit most of the hand. There was no canal. The testicle and cord on that side were four time the normal size and weight; on this account, particularly, Dr. Brown advised against operation unless the patient would sanction orchidectomy. But the man insisted upon herniotomy without removal of the testicle, and Dr. Brown performed a modified Halsted operation with a much more satisfactory result than he had expected. He did not present the patient as permanently cured. As yet there was no indication of recurrence.

At the upper and inner periphery of the ring a transverse inch-and-a-quarter incision was carried through the oblique and transversalis muscles to the semilunar line. In the inner angle of this incision the large cord was suspended and the muscles closed in layers outside it. The tissues of the ring were approximated with kangaroo tendon. To lessen the intra-abdominal tension the patient was maintained in a prone position for four weeks. Despite a bronchitis, which developed on the fourth day, primary union of the wound was obtained.

FRACTURE WITH DISLOCATION OF HUMERUS TREATED BY ARTHROTOMY.

Dr. W. T. Bull presented a patient, a boy, aged fifteen years, who was admitted to the New York Hospital. April 10, 1896, shortly after having been knocked down and striking on his right hand and elbow. The right shoulder was much swollen, the deltoid rigid, the arm, from acromion to left epicondyle, shorter by three-quarters of an inch than the other. There was a soft crepitus on rotation, and the head could be felt immovable in the axilla.

Forty-eight hours after admission, under ether, futile efforts were made by manipulation and direct pressure to replace the head. A longitudinal incision was made through the fibres of deltoid just internal to acromion, exposing the seat of fracture and capsule of the joint. The upper epiphysis, consisting of the head and two tuberosities, was separated from the shaft, but held in close contact by peritoneum and fascia. The head was fully in the axilla, and there was no displacement relative to the shaft. After division of the capsule the head was drilled, McBurney's hook inserted, and traction made with pressure on the head. This failing to move the head, wider division of the capsule was made and then the head was pried into place with a periosteal retractor.

The anterior or outer part of the wound was closed over an iodoform tampon which rested on the head of humerus, and a second one was placed in a counter-opening posteriorly, also leading to within the capsule. Plaster-of-Paris bandage. There was a moderate wound reaction, but no profuse suppuration. In two months the wounds were superficial and motion improving. In two and a half months all wounds were healed.

The splint was used for eight weeks. At the end of eight months (December 9, 1896) it is found that the boy has for practical purposes good use of the arm and hand. There is no shortening nor atrophy, though just below the acromion the fulness of the deltoid is less marked than on the other side. Moderate stiffness, while the head of the bone is clearly in place. Rotation possible to about one-half its normal extent. Abduction about three-quarters of the way to the right angle (horizontal position). The movements of the scapula complete a range of motion but a trifle short of that possible on the sound side.

RESULT OF HALSTED'S OPERATION FOR CARCINOMA OF BREAST.

Dr. Charles McBurney presented a woman in illustration of the result of a Halsted operation for carcinoma of the breast. The carcinoma was of the fibrous variety, had been present two years, there was little involvement of the glands of the axilla. The operation, performed six months ago, included removal of the breast, the pectoralis major muscle excepting the clavicular portion, and the whole of the pectoralis minor, the dissection being carried up to the clavicle. Primary union was obtained. He wished to call attention to the shape of the flap, which he had applied in a large number of cases, and which he thought was a very desirable one. The outward and lower incision was not carried into or above the axilla, but below it, thus avoiding leaving a scar in the axilla and permitting of the freest motion of the arm. The patient said the difference in extent of the motion between the two arms was not noticeable to herself. Dr. McBurney had found in general that return of motion was not only more complete, but more rapid after Halsted's operation than after the old method in which the pectoral muscles were not removed. The incision shown permitted one to easily raise the flap and expose the whole length of the clavicle. Open dress could be worn without exposing the line of incision,—a matter of some importance to certain patients.

PASSAGE OF BULLET THROUGH THE ABDOMEN WITHOUT WOUNDING THE INTESTINE.

Dr. L. A. Stimson said, on presenting a young man, that it did not often happen that a bullet could pass through the abdominal cavity in the neighborhood of the intestine without wounding the latter. This patient was shot in the abdomen about three inches to the left of the umbilicus, on November 12, 1896, and was brought to the Hudson Street Hospital, where Dr. Stimson immediately explored the wound by enlarging it and found that the bullet had entered the abdominal cavity. He then opened the cavity freely, found that it contained but little blood, and no evidence of intestinal perforation. Pursuing the search, and lifting the intestines out of the way, he could find no perforation of the latter, but did find where the bullet entered the opposite posterior abdominal wall a little to the left of the aorta. The ends of two epiploic appendages of the sigmoid flexure had been cut by the bullet. About two-thirds of the length of the small intestine were lifted out in the search for a perforation, but none was found. The patient made a good recovery.

One other case of passage of a bullet through the abdomen without wounding the intestine or other viscera had come under his care. The cases were sufficiently rare to justify placing them on record.

INTRAMUSCULAR ENTRANCE IN OPERATING FOR APPENDICITIS.

Dr. Stimson, in presenting several patients, spoke of the method of reaching the appendix in appendicitis without division of the muscular or tendinous structures, as first devised by Dr. McBurney. But Dr. McBurney had urged that the method be used only in non-suppurative cases, or those which would not require drainage, expressing the fear that if it were utilized in other cases it might be charged with failures, which would damage its availability in cases for which it was distinctly suited. After employing it for some time as recommended by Dr. McBurney, Dr. Stimson had been led to enlarge its use, and for the last two years had employed it in almost every case of appendicitis, including those in which abscess was present and drainage was required. And he had been very much pleased to learn that the operation which had yielded such good results in the simple, non-suppurative cases did also yield similar results and possessed the same advantages in suppurative cases. From a number of cases he had taken three at random, whom he presented for the inspection of the society, showing the results in suppurative cases. In all the abdomen had been opened by splitting the aponeurosis of the external oblique, separating the fibres of the underlying muscles, and dividing the fascia and peritoneum transversely. After having removed the appendix and the pus, and inserted gauze and rubber drains, the opening was narrowed by catgut sutures in the different layers, leaving a hole not more than an inch in diameter, which proved ample for drainage. Until last week he had not lost a suppurative case in which this method was used. In that case general peritonitis was already present; it was checked by the operation, but intestinal paresis persisted, and the patient died on the fourth day. A similar case treated two or three days later recovered. In his judgment the time had come when the operation could be safely extended to suppurative cases and the patients be given the benefit of reconstitution of the abdominal wall in all its strength which attended the method. He would add that in cases in which the opening proved too small to permit of the necessary manipulation within the abdomen, it could be enlarged by cutting at right angles to the deeper part of the incision along the border of the rectus: this secondary incision could then be closed by suture, and drainage made through the primary portion as in other cases.

FATAL SHOT-WOUND OF CRANIUM.

DR. STIMSON presented a shot, No. 7, split into two parts, probably the smallest specimen ever presented to the society, but which had killed a man. The patient was out shooting small game, and a companion in shooting at a rabbit had accidentally shot him at a distance of fifty feet, the shot entering midway between the right tendo-oculis and the inner end of the eyebrow.

He instantly fell on the face, unconscious, and remained unconscious about an hour. For two days he had severe headache, then grew better, and within a week felt so well that he went out for a drive. The following morning he suddenly became unconscious, had convulsive movements of both arms, especially of the right, and after about an hour vomited blood profusely and bled at both nostrils. Dr. Stimson saw him about fourteen hours later, nine days after the injury. The pulse was 150; the temperature over 105° F. Death took place two hours later.

The autopsy showed that the shot presented had passed through the frontal bone and emerged on the inner side three-eighths of an inch to the right of the crista galli. It happened that in this particular case there was at this point no frontal sinus, and the bone-plate was very thin. Continuing, the shot had gone on in the right frontal lobe to near the circle of Willis and there lodged. No vessels of size had been injured, but there was considerable subarachnoidal hæmorrhage. He had first supposed the cribriform plate had been injured, and blood had found its way to the nose in that way, but the autopsy showed no communication with the exterior except at the entrance wound in the frontal bone. The epistaxis was possibly due to venous stasis by pressure of the intracranial extravasation.

STRANGULATED HERNIA.

Dr. William T. Bull read a paper entitled "Notes on Cases of Strangulated Hernia."

Dr. W. B. Coley said that his personal experience with strangulated hernia had been confined to nine cases. In view of the fact that most surgeons regard strangulation in infants and young children as almost unknown, it is interesting to note that six of these cases occurred in children under two and a half years, three under one year. Of these six cases five recovered; one aged eight weeks, nearly moribund at the time of operation, died, giving a mortality of 16⅔ per cent. Stern, who has laboriously investigated the statistics of strangulated hernia in early childhood from the records of leading European hospitals, found in 1900 herniotomies but thirteen were in children under four years. He collects 138 cases. The mortality before 1874 was 33⅓ per cent.; 1874–1893 it was 21.3 per cent.

Two other cases of strangulated hernia in infants have recently been observed at the Hospital for the Ruptured and Crippled. In one case the family refused operation. In the other, aged three months, taxis had been tried to such an extent that the child was in desperate condition when it came to the hospital. Very slight taxis was used by the house-surgeon with the effect of reduction of the hernia. Death occurred about four hours after. There was no autopsy.

The adult cases were three in number, two femoral, one sigmoid inguinal. Two recovered. The fatal case was one of gangrenous femoral hernia that had been tightly strangulated for eighty hours. The patient's condition was good. A primary resection of intestine was made with end-to-end suture, without any mechanical aids. The placing of two rows of right-angle continuous Lembert sutures occupied but twelve minutes. The patient died on the seventh day. Partial autopsy showed no leakage and no apparent signs of peritonitis. Death seemed to have been due to intestinal paresis.

Primary resection *versus* artificial anus is a difficult question to settle. Borchard, in his recent report of 100 cases of strangulated hernia treated in the University of Königsburg, states that in twenty cases of gangrenous hernia treated by artificial anus the mortality was 80 per cent.; while in eleven cases treated by primary resection it was only 47½ per cent. In the majority of cases, unless the condition of the patient strongly contraindicates, primary resection should be performed, it being always understood that the requisite surgical skill is at hand.

DR. ARPAD G. GERSTER related a case bearing on prolonged taxis in strangulated hernia, which had been properly condemned in Dr. Bull's paper. A man, twenty-one years of age, had had strangulated hernia for eight hours before a physician was called. This well-meaning person tried taxis, and tried it so faithfully that, as he described it, the tumor increased to twice its former size under his hands. Finally, he and the friends of the patient concluded it was time to call a surgeon. When Dr. Gerster arrived he found the patient already in miserable general condition; pulse poor, fæcal vomiting frequent. The point which he wished to bring before the society was the status of the intestine found on exposure of the hernia. The efforts at reposition of the strangulated small intestine must have been very persistent, for they had resulted in literally stripping off the peritoneal covering of the intestine over an area in length of more than ten inches, exposing the muscularis of the gut. Apparently the sudden increase in size of the hernial sac was due to this traumatism. The sac was filled with dark clotted blood, and the torn off peritoneum was floating in a pool of blood. The strangulation was easily relieved, but the patient's general condition was such that he did not feel justified in doing resection, but simply incised the intestine and left the loop exposed in the wound. Vomiting continued, and the patient succumbed after thirty-six hours. There were no signs of peritonitis, but the intestine above the strangulation was very much dilated and apparently in a paralytic condition.

DR. ABBE made a suggestion which he thought would, if it were generally observed, result in improving our statistics of strangulated hernia. Nearly all cases are brought to the surgeon's notice during the stage of feculent vomiting or regurgitation of very offensive material. He had found that if the stomach was emptied the vomiting would cease at once. He could say with certainty that in two or three of his cases life was saved by washing out the stomach before or just after the operation. It should be made a rule to wash out the stomach in every case before operating, for if this were not done ether vomiting would be liable to contaminate the lungs with a certain amount of the vomit and induce pneumonia. He had observed that patients who were almost at the point of death from incessant vomiting pass into a sound sleep after washing out the offensive material from the stomach.

Stated Meeting, December 23, 1896.

The President, FRANK HARTLEY, M.D., in the Chair.

ORTHOPÆDIC OPERATIONS AT THE HOSPITAL FOR THE RUPTURED AND CRIPPLED FROM OCTOBER 1, 1895, TO OCTOBER 1, 1896.

DR. VIRGIL P. GIBNEY read a paper with the above title, for which see page 315.

GASTRO-INTESTINAL ANASTOMOSIS FOR ULCER OF STOMACH.

DR. WILLY MEYER presented a woman, thirty-five years of age, who had for ten years suffered more or less from pain in the stomach.

Ten years ago she had vomited blood and had all of the symptoms of gastric ulcer. The pain was at times so severe that she had to enter some hospital, among others the New York Hospital. She had lost considerable in weight, and had become so disgusted with her condition that she asked her physician for relief by operation. Dr. Meyer saw her in the German Hospital, and while he did not find that the symptoms pointed to stenosis of the pylorus, yet there was evidently some chronic disease of the gastric walls, and perhaps some adhesions or other trouble situated below. Consequently an exploratory incision was made. In the lesser curvature of the stomach were found deep cicatrices, which had thrown the stomach walls into folds. There were many surrounding adhesions, some so firm that they seemed to cause stricture of the stomach lumen. Thinking it inadvisable to interfere with the cicatrices, he decided to do gastro-intestinal anastomosis.

The patient made a very good recovery so far as the operation was concerned, but had not yet gained much in weight. She was improving some under medical treatment.

CARCINOMATOUS STRICTURE OF THE PYLORUS.

Dr. Meyer presented a second patient, a man, thirty years of age, who was admitted to hospital for symptoms of stricture of the pylorus existing ten weeks prior to November 1. Palpation under narcosis failed to reveal physical signs of tumor, but analysis of the stomach contents pointed clearly to that condition. Meat and rice eaten in the evening were found in the stomach after twelve hours. The pylorus was evidently hidden beneath the liver, and when the abdomen was opened it had to be grasped and pulled out from its hiding place. It contained a large malignant tumor, and was quite free from adhesions. There were secondary deposits in the glands. Dr. Meyer made gastro-intestinal anastomosis with the Murphy button, which had not since been found in the stools. In his previous (six) cases it had also remained in the stomach, as shown subsequently when the patients died of their disease. This patient had had no pain since the operation, ate whatever he wished, and had gained from five to six pounds in weight every week since the first of November.

INDEX TO SURGICAL PROGRESS.

GENERAL SURGERY.

I. Relation of Chemotaxis and Leucocytosis to the Antiphlogistic Action of Certain Substances. By Dr. O. Kawalewsky (Berne). The author attempted to solve the problem as to whether the action of many antiseptics was due to their bactericidal properties or to their producing a leucocytosis. The substances employed were iodine, iodide of potassium, bichloride of mercury, and zinc chloride. He employed capillary tubes, six to seven centimetres long, filled with 0.3 to 0.5 millimetre of the substance to be examined. These were crushed after having been placed under the skin of rabbits and removed after twenty-four hours, and the number of leucocytes which had entered the tube noted as evidence of chemotactic properties of the substances used. Their influence on leucocytosis was determined by injecting two cubic centimetres into the ear vein on one side and then withdrawing some of the blood of the opposite ear. He concludes that all of the above chemicals act as positive chemotactics and also produce a leucocytosis. Hence the action of the above-named antiseptics is equally as much through chemotaxis, thus causing leucocytosis, as by their bactericidal properties.—*Inaugural Dissertation*, Berne.

II. Action of Chloroform upon the Tissues. By Dr. K. Ajello (Milan). The author gives the result of a study of 214 cases of chloroform anæsthesia, in which the urine was carefully examined. The results do not differ from those which have been published by other investigators. Albuminuria occurred in 80 per cent. of the cases, lasting from two to six days. Its occurrence is favored by age, severe illnesses, especially diseases of the heart and blood-vessels, by diabetes, and by protracted or repeated anæsthesias. Sugar was never found; acetone was never found. In 60 per cent. of the cases casts were present, mostly hyaline, but also a few epithelial and granular. He also examined the kidneys, heart, and muscles in four cases of fatal chloroform syncope, and twenty animals (dogs) to whom he had administered chloroform. He found all degrees of changes in the kidneys from simple hyperæmia and capillary hæmorrhages to extensive coagulation necrosis of the renal epithelium and exudates into the capsules. In the liver fatty degeneration and necrosis; in the striated muscles, loss of striation and fatty changes. In the blood-vessels hyaline and fatty degeneration had taken place.—*Monograph*, Milan, 1896.

III. Airol and other New Substitutes for Iodoform. By DR. CARL S. HAEGELER (Basel). An effort to discuss a new substitute for iodoform is met with scepticism, for there have been many announced which have failed in their purpose. The three chief objections to iodoform have been its toxic action, the fact that it frequently acts as an irritant to the skin and its disagreeable odor. Despite the many articles which have been written, its exact action is unknown. We do know that it is not an antiseptic, and that wounds can be infected by the use of non-sterile iodoform. It undoubtedly acts through its products of decomposition, the principal one of which is iodine. Whether it acts upon the micro-organisms, their toxines, or upon the tissues is unknown. Where putrefaction is taking place it is readily decomposed. Its anti-tuberculous action is also clearly established, whether by acting upon the bacilli or by modifying the tuberculous tissue is also unknown. What we demand of a substitute for iodoform is: (1) it shall not be as toxic; (2) it shall not have any odor; (3) it shall not irritate the skin; (4) it shall contain a sufficient quantity of iodine or a similar effective antiseptic, which it can part with under the same conditions as iodoform. Iodol and aristol do not fulfil these these. Dermatol has but a feeble antiseptic action, and has its principal use in dermatological practice on account of the bismuth it contains.

Lüdy introduced iodine into the combination of gallic acid and bismuth, of which dermatol is composed, and produced airol. This substance rapidly gives up its iodine, when introduced into wounds, through the action of the temperature of the body.

The author fed guinea-pigs, white mice, and cats toxic doses of dermatol and airol and produced ulcerations in the colon and perforation of the stomach, so that they are not suitable for internal administration. He tried the action of iodoform, airol, and dermatol on various pathogenic bacteria. Iodoform checked the growth of all except the cholera bacillus, which it killed. Airol acted similarly, its action on pyogenic micro-organisms like that of iodoform being less marked than upon others, but the conditions in the test-tube are not the same as in wounds, where, as Braatz has shown, both antiseptics cause a complete cessation of growth of staphylococcus aureus. The experiments conducted by the author upon animals gave varying and unsatisfactory results.

In practice we need a powder which, by virtue of its property of liberating iodine in a nascent state, as iodoform does, will act as an antiseptic, and at the same time have desiccant properties so as to dry up wound secretions. Airol fulfils both of these requirements, and, in addition, is free from the toxic and irritant properties of iodoform, and, above all, its disagreeable odor. The author used airol for two years in policlinical work and found that it had many advantages over iodoforn.

It contains bismuth, and thus acts as a desiccant. In the treatment of furuncles and carbuncles, it is only used in the form of gauze (10 per cent.) impregnated with the powder, after opening the same. In erysipelas the liberation of iodine cannot keep pace with the advance of micro-organisms along the lymph-vessels, and hence it is of no value. In phlegmonous inflammations caused by streptococci it is of great value. In dressing recent injuries its mild antiseptic action is of great value, for experience has taught us that aseptic dressings are not as satisfactory in these cases as antiseptic. The author believes that airol can be placed side by side with iodoform, and that in some respects it excels it. It stimulates granulations and can be used in combination with sterile wet dressings in the form of a powder in the treatment of acute phlegmons. For injecting tubercular joints the author uses a 10 per cent. emulsion, and has noticed an action upon these tissues similar to that of iodoform. He has employed airol in over 2000 cases, and believes it can be highly recommended.—*Beiträge zur klinische Chirurgie*, Band xv, Heft 1, p. 266.

DANIEL N. EISENDRATH (Chicago).

HEAD AND NECK.

I. Total Necrosis of the Lower Jaw following Osteomyelitis. By O. FAISST (Tübingen). The following interesting case was observed in Bruns's clinic.

A girl, twelve years old, presented a marked increase in size laterally of the region of the lower jaw, the mouth could not be closed. Foul pus and saliva were discharged freely, and examination showed that the whole lower jaw was converted into a sequestrum. It was easily removed by cutting through it with bone forceps.

The history pointed unmistakably to an osteomyelitis, two years previously. The author finds only a very few cases on record where total necrosis followed osteomyelitis. He mentions only eight instances altogether of total necrosis, excepting, of course, the specific form that follows phosphorus-poisoning. — *Beiträge zur klinische Chirurgie*, Band xv, Heft 111.

II. On the Treatment of Torticollis. By DR. HARTMANN (Rostock). Hartmann has analyzed twenty-two cases of torticollis operated on in the Rostock clinic between 1879–1894.

Only one-third of the cases gave an absolutely perfect result. The treatment consisted in division of the sterno-mastoid muscle either subcutaneously or by the open method. The author is inclined to believe that a division of the sterno-mastoid muscle follows the usual course of uniting without shortening, while the bad results are to be attributed to degenerative muscular processes uninfluenced by the operation. It is conceded that total removal of the sterno-mastoid muscle, as recommended by Mikulicz, does away absolutely with the possibility of recurrence through changes in the muscle; but the author thinks the sphere of such an operation to be very limited, especially as the degenerative process sooner or later comes to a stand-still, and the muscle is only passively of harm, in that it is too short and needs cutting.—*Beiträge zur klinische Chirurgie*, Band xv, Heft 111.

III. Three Hundred Operations for Goitre in the Tübingen Clinic, 1883–1894. By H. BERGEAT (Tübingen). In an article of eighty-seven pages, the author continues the work of reporting all the cases observed in this clinic (previous publications by Sueskind, 1877, and Fischer, 1883).

The proportion of female cases to men is in the ratio of 2.5 to 1. The greatest number begin in the male sex between fourteen and seventeen years of age, in the female between twelve and sixteen, showing a predisposition to accompany the manifestations of puberty.

Special stress is laid on the etiological importance of hard manual labor, operations in persons in easy circumstances are a rarity. Only two cases of total extirpation are recorded, as already in 1883 the danger of this procedure had become evident. Beginning with the year 1885, the typical intraglandular enucleation became more and more the operation of choice, although in the later cases are many examples of extracapsular extirpation; this latter operation regaining the favor temporarily diminished by the increasing success of enucleation. A full trial of enucleation showed that it was not without occasional disadvantages, and the opinion now prevails that the best method is often a combination of the two procedures.

In regard to the indications for operation, the ground is taken that every non-malignant goitre which is attended with manifest disturbances, or is growing so rapidly as to forebode their speedy occurrence, should be subjected to operation; but cosmetic reasons alone should seldom constitute an indication. Experience having shown that goitre beginning at the time of puberty often diminishes spontaneously, the operation was performed less readily in young persons. The patients belonged almost exclusively to the laboring classes, and the majority sought treatment for relief of respiratory disturbances presenting all degrees of intensity. Twenty-one patients had difficulty in swallowing before operation, and there were likewise thirty-three instances of paresis of the vocal cords of the side affected.

As regards the nature of the goitres, these were divided into, parenchymatous, 89; cystic, 73; combined forms, 116.

The site was in 53 per cent. chiefly or almost wholly in the right lobe; in 22 per cent. chiefly or almost wholly in the left lobe; in 7 per cent. in middle lobe; in 18 per cent. differentiation of most affected lobe impossible.

Bergeat lays emphasis on the fact that while the parenchymatous form comes to operation on an average fourteen to fifteen years after its inception, the cystic form sets up disturbances requiring operative interference at a considerably earlier period; nearly one-half of such cases coming to operation within four years of their beginning.

The 300 operations were divided as follows: one-sided extirpation, 79; enucleation, 176; and by the combined method, 45.

In ten instances the operation for obvious reasons was performed without any anæsthetic. (Why cocaine should only have been used twice under such conditions is not stated.) Bergeat much prefers so operating to experiencing the difficulties of unsatisfactory anæsthesia, and claims that with the co-operation of good sense on the patient's part it is a perfectly feasible procedure. It presents the advantage, as shown in one case, of allowing the recurrent laryngeal nerve to be at once recognized if seized. Great care was exercised in checking all bleeding, catgut being used to tie the vessels.

In performing one-sided extirpation, the vessels were secured according as their situation was most favorable, whether intra- or extracapsular. Severe hæmorrhage attending extirpation was the exception ; secondary hæmorrhage occurred in 6 per cent. ; in only two instances was it of a serious nature. The recurrent laryngeal nerve was injured five times, always on the right side.

The intraglandular enucleation of cysts was often attended by considerable difficulty ; sharp bleeding, thick layers of overlying parenchyma, firm adhesions, sometimes necessitating the adoption of another method. The occurrence of secondary hæmorrhage was also somewhat more frequent than in extirpation.

In general the wounds were drained. The average length of stay in the hospital was after extirpation eleven days, after enucleation nine days. The immediate relief of symptoms was generally most striking, disturbances of deglutition persisting the longest. A rise of temperature was nearly always a feature of the convalescence, and although the usual course of wound-healing was nearly perfect, only three histories out of 249 show the absence of fever. The temperature curve was practically the same in all cases, the highest point being reached the second or third evening, with a gradual decline. So typical was the course that the dressing was not changed unless there was a persistence of temperature which occurred only exceptionally. The author attributes the cause to aseptic absorption. There were six deaths, a mortality of only 2 per cent.

In investigating the ultimate results of the above operations, satisfactory data were obtainable in only eighty-four cases. The results were usually tabulated from the anatomical conditions. Two-thirds of the cases investigated showed some form of recurrence. The results were in favor of the one-sided extirpation, and this circumstance, the author points out, seems all the more natural, as there is more chance of recurrence when three lobes are left than where one or two have been extirpated.

The treatment of malignant growths of the thyroid was attended with only the saddest results. Few cases were of an operable nature, and none survived an operation a year.

The article does not go into the question of treatment of exophthalmic goitre, clinical observations being lacking.—*Beiträge zur klinische Chirurgie*, Band xv, Heft 3.

CHARLES L. GIBSON (New York).

ABDOMEN.

I. On Tuberculosis of Herniæ. By E. ROTH (Heidelberg). The author publishes three cases of this condition occurring in the clinic of Czerny, of Heidelberg. In the first case, double inguinal hernia in a boy, four years old, there was a tubercular process in both sacs continuous with existing peritoneal tuberculosis. Examination two years after operation showed no presence of a tubercular lesion in any portion of the body.

In a second case, a man, aged thirty-eight years, tuberculosis of the sac and omentum coexisted. The third case, a man, aged fifty-five years, there was found an extensive matting together of the intestines, with abscess-formation and tubercular deposits throughout. The diagnosis was confirmed by microscopical examination in all three cases. A review of the total number of cases recorded (twenty-two) follows, from which the following conclusions are drawn: That tuberculosis of the hernial sac occurs only exceptionally as a primary and local process; it is usually a secondary condition, the remainder of the peritoneum being generally involved. The prognosis of this disease depends naturally on the situation, extent, and severity of the underlying condition. Some of the good results here tabulated are apparently due to the opening of the peritoneum and evacuation of the fluid.

Whenever feasible, treatment should be of an operative nature; the sac and the omentum can be excised where the process is localized. Slight changes in the intestines do not require interference, as spontaneous healing may take place. Pronounced ulceration of a limited portion of the intestines might give rise to indications for resection. With extensive intraperitoneal disease the scope of operative treatment becomes narrower, and in general tuberculosis no operation should be undertaken except for relief of obstruction.—*Beiträge zur klinische Chirurgie*, Band xv, Heft 3.

Charles L. Gibson (New York).

II. Can Micro-Organisms pass through the Intact Intestinal Wall? By Dr. M. Neisser. It is well known that the tubercle bacillus and anthrax often first localize in the intestine and are then disseminated in the body. Similarly the typhoid bacillus and various members of the bacillus-coli group enter the blood and are thus carried through the intestinal wall to distant parts. The author fed normal healthy animals enormous quantities of staphylococci, streptococci, and bacilli pyocyanei, and by mechanical and chemical means injured the intestine to aid the passage of these germs into the blood and into the organs of the infected animals. Out of thirty-eight so treated, twenty-six gave negative results. In thirteen individual organs were not found sterile, and in only one of these was found the same micro-organism which had been fed. He concludes that highly pathogenic micro-organisms may remain for days in the intestine without giving rise to a general infection. Even severe injury of the gut itself does not suffice to permit the saprophytes to enter the circulation. Hence there is no more danger of general infection from the intestinal tract than from the skin or any of the other mucous membranes.—*Zeitschrift für Hygiene und Infectionskrankheiten*, Band xxii.

D. N. Eisendrath (Chicago).

GENITO-URINARY ORGANS.

I. Experiments in Anastomosis of the Ureters. By Dr. U. Monari (Bologna). The author has devised several novel procedures with a view to amplifying or supplanting the usual technique now in vogue. He has added to the value of his experiments by demonstrating on dogs that a considerable length of the ureter may be displaced from its usual position, provided it is eventually restored to its original surrounding and covered with a portion of peritoneum. The following are some of the experiments:

Lateral anastomosis of the ureters, as in operations on intestines. This procedure is applicable where only a very slight portion of the ureter is sacrificed.

Where a greater length of ureter is excised (six centimetres in dogs), dissecting out ureter with a strip of peritoneum, fifteen millimetres wide, excision of the required portion, longitudinal incision six millimetres long on the posterior aspect. Sutures of the finest catgut are passed across from one side to the corresponding side of the other end in alternation, beginning at the apex of the V-shaped incisions, the cross-section is then sutured, effecting final closure. Suture of the periureteral tissues, and finally of the small strips of peritoneum. Counter-opening in lumbar region through which gauze-packing is carried to the site of operation as a precautionary measure. Another procedure, where sufficient approximation for lateral anastomosis cannot be obtained, consists in an operation in two stages; first, fastening the divided ends under considerable tension into the external wound, and in a month later the two portions have stretched sufficiently to permit of anastomosis.

Division of the ureter near the bladder and anastomosis with the opposite side. The subject was killed four months later, and the examination showed that the artificial orifice was sufficiently large, but that compression of the ureter had taken place where the hole had been bored in the mesentery for its passage.

The author expresses himself as convinced that both of his methods of anastomosis are to be recommended.—*Beiträge zur klinische Chirurgie*, Band xv, Heft 3, p. 720.

II. The Operative Treatment of Male Epispadias and Hypospadias by Rosenberger's Method. By Walter Denison, M.D. (Strassburg). At the Twentieth Congress of the German Surgical Society (1891) Rosenberger described a method of treating epispadias which had given him a good result and improved on the older procedures by its greater simplicity. Briefly described, the operation consists in refreshing the edges of the penile furrow, extending it till the abdominal parietes are reached, then excising two parallel strips of skin corresponding in size to the freshened penile portion. Bringing the penis on the abdomen the denuded portions come in contact and the penis is sutured in place, the penile furrow being converted into an urethra running from below upward. A second act, at a later period, consists in dissecting the penis out of its new bed, and with it a strip of skin of the proper size continuous with the glans and divided in the direction of the umbilicus. This flap is now turned down and the two raw surfaces united to each other.

The principle just outlined was utilized by Landerer and Bidder for the treatment of hypospadias. Landerer excises two strips parallel to the defect in the penis continuing into the scrotum. When the sutures are applied, the scrotal skin forms the floor of the new urethra. A second operation later approximates the penile edges and covers in the newly-formed urethra.

Denison's paper gives a report of three cases from Madelung's clinic, two operations for epispadias and one for hypospadias. He has investigated all the cases on record (eleven) of this operation and draws the following conclusions:

"The operative treatment of epispadias by Rosenberger's method gives no better final results than previous procedures. The incontinence of urine is not affected, and the form of the penis, with regard to its sexual function, is not improved. It is less valuable than Thiersch's method (as modified by Krönlein and Trendelenburg), though it must be acknowledged that it is easier, and affects the construction of a closed urethra in decidedly less time.

"As regards the operative treatment of hypospadias, the method is a distinct advance over the others in simplicity and safety of its accomplishment. It does not modify the deformity of the organ, but rather tends to increase the hook-like appearance."—*Beiträge zur klinische Chirurgie*, Band xv, Heft 3, p. 735.

Charles L. Gibson, (New York).

CORRESPONDENCE.

CASTRATION IN ENLARGEMENT OF THE PROSTATE.

To the Editor of the ANNALS OF SURGERY:

IN January of last year I saw in consultation with Dr. Bennett, of Liscard, an old gentleman of sixty-seven, who was very ill from troubles connected with micturition. For years he had been in difficulties with his urine, but twelve months before I saw him he had to retire from business owing to debility and worry from the frequent calls to urinate, which gave him no peace either day or night.

We found him with his bladder distended to above the umbilicus, although he gave a history, not of the usual overflow dribbling, but of having passed two or three ounces of urine several times a day and almost half-hourly during the night. The urine was alkaline, fetid, loaded with mucus, and contained pus. The passage of the catheter was not attended by any great difficulty, although clearly obstructed at the mouth of the bladder. His prostate was as large as a Newtown pippin, presenting a marked convex protrusion in the rectum, hard and unyielding, painful to the touch. His scrotum was covered with herpes. His mental condition showed signs of wear and tear, and he was restless, irritable, and morose. Alcohol invariably increased the severity of his troubles. We discussed the propriety of castration, but decided that means should first be taken to rid the scrotum of its herpes, and meanwhile, by rigid antiseptic precautions, keep the bladder clean and empty.

I did not see the patient again until shortly before I operated in April. He was as bad as ever in spite of every care. His urine was almost all residual, his nights constantly disturbed, his general condition pitiable. For six weeks retention had been complete. Under the care of Dr. Barendt and Dr. Bennett he had sufficiently recovered from his scrotal eruption to allow of operation.

There is nothing to relate of the operation except that both testes were removed. Mr. Thelwall Thomas, who was anxious to examine the prostate, was present. The patient made an uneventful recovery in spite of a constant, restless interference with the dressings. In a fortnight's time the prostate had sensibly diminished in hardness, he had less pain, his urine presented less fetor and purulent deposit, and in a few weeks Dr. Bennett wrote me: "The residual urine has diminished in six weeks to one-fourth its usual amount, and in the early part of June, two months after the operation, he has felt comfortable and able to dispense with the catheter." I saw him a short while back, when he walked briskly into my room, very grateful for the marked improvement which had followed the removal of his testes. His prostate was reduced in size by a good half. On Tuesday last he called and assured me that he felt uncommonly well. He could retain his urine for four hours. There was barely any residual collection. The bladder contractility was assured, and, as he put it, "I'm a young man free from pain, strong and active." For the past six months, Dr. Crooke, of Liscard, has taken charge of him.

This was the first of four cases upon which I have operated. In one other case I removed both testes, in another I divided the vas, turning the lower end into the wound, and I have at present in the hospital a case, sent me by Dr. Hugh Shaw, where I removed one testicle for considerable enlargement of the prostate more especially involving one side.

I will not attempt to enter into the details of each case. Suffice it that a complete operation was performed upon a patient of sixty-five, who had led the catheter life for five years, who frequently suffered retention, and at times decomposition of urine. He had full sexual power, but gladly submitted to operation. The case was complicated by double inguinal hernia. The prostate before operation was the size of a hen's egg, and three months later was reduced, as in the other case, to about one-half its previous dimensions. In a fortnight the bladder commenced to act, and in six weeks no further occasion for a catheter existed, except the patient's desire to use it from the effect of long habit.

I divided the vas in the case of an old chronic urinary case fifty-six years of age, where symptoms of stone in prostate and bladder complicated the issue. Both Dr. Thompson and myself, although we could note no difference in the size of the prostate, were convinced of considerable amelioration in symptoms, more especially in regard to the diminished residual pool. Later by a suprapubic incision we removed a large phosphatic calculus from the bladder and another smaller one from the prostate with considerable benefit.

It is too early to speak definitely of the fourth case, which was only operated upon three weeks ago. Certain points, however, are worthy of note in view of White's experiments pointing to unilateral atrophy of the prostate after single castration. Dr. Craig, my house surgeon, supplies me with the following brief history:

"Patient, aged fifty-seven years, a musician, has always been a fairly heavy drinker. He has never suffered from any urinary trouble up to the beginning of the present illness."

This commenced eighteen months ago, when he began to experience some difficulty in emptying his bladder. At this time his urine occasionally dribbled away, especially after a too free indulgence in alcohol. Since then his symptoms have undergone progressive aggravation. There is a history of pain and straining on urination, the pain being of a burning character, and referred to the point of the penis. Within the last three months before admission, micturition became very frequent, the patient having to get up ten or twelve times during the night, and the tenesmus was so severe that he feared to attempt the act of micturition except in the water-closet, as the tenesmus extended to the rectum. There had never been a complete stoppage of urine.

On admission the prostate was felt per rectum to be enlarged to the size of a Tangerine orange. This enlargement was asymmetrical, affecting principally the right lobe. The gland was very hard and projected into the rectum. On passing a catheter no resistance was encountered until the prostate was reached. The passage of the instrument results in the withdrawal of about twenty ounces of blood-stained urine, even when patient has just micturated.

January 13. Right testicle excised.

January 20. Wound quite healed. Improvement already noticed in symptoms.

January 23. Patient passes urine much more freely, and with less pain and straining. Interval much longer. Patient has passed urine only three times to-day,—at 6 A.M., 10.30 A.M., and 8 P.M. The passage of the catheter evacuates only about twelve ounces of urine containing no blood.

The prostate is felt to be softer, flatter, and less prominent. The inequality of the two lobes is less marked, the right having undergone the more rapid atrophy.

My experience, therefore, of castration in enlarged prostate, judged in the light and promise of four cases, is distinctly a happy one, and should, I venture to think, encourage us in more frequent recourse to it.

ROBERT JONES.

LIVERPOOL, ENG., January 28, 1897.

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THE OPERATIVE TREATMENT OF CANCER OF THE RECTUM.[1]

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I. Anatomical Considerations.

UNTIL comparatively recently it was customary to describe the rectum as that part of the large intestine extending from opposite the left sacro-iliac articulation to the anus, and the loop between it and the termination of the descending colon was known as the sigmoid flexure, and in most of our text-books this description still obtains. However, I agree with Mr. Treves, that it is better to consider the rectum as extending from the level of the third sacral vertebra. Between the point where the colon reaches the iliac fossa on the left side and the point where it comes to lie opposite the third sacral vertebra it consists of a single loop which is said to resemble in outline the Greek capital omega. It is connected by a mesentery to the iliac fossa and posterior pelvic wall. This mesentery varies considerably in length in different subjects, the mobility of the loop of course varying accordingly. This latter is usually found coiled in such a way as to form a series of minor loops which, when the bladder is empty, lie for the most part in the cavity of the true pelvis. The three longitudinal muscular bands are also continued downwards over the entire extent of this loop, and it is only from the third sacral vertebra onward that the longitudinal muscular fibres are uniformly spread over the tube. (Cunningham.)

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[1] Presidential address delivered at the opening meeting of the Biological Association of the Dublin University, November 26, 1896.

For convenience' sake I shall name the portion of the loop with its mesentery in the iliac fossa the iliac colon, and the remainder with its mesentery in the pelvis, the pelvic colon.

The drawing reproduced in Figure 1 was originally prepared to illustrate an example of iliac retention of the testis, but it shows also very well the loop of intestine to which I have just referred, extending from the iliac fossa above downward into the pelvis.[1]

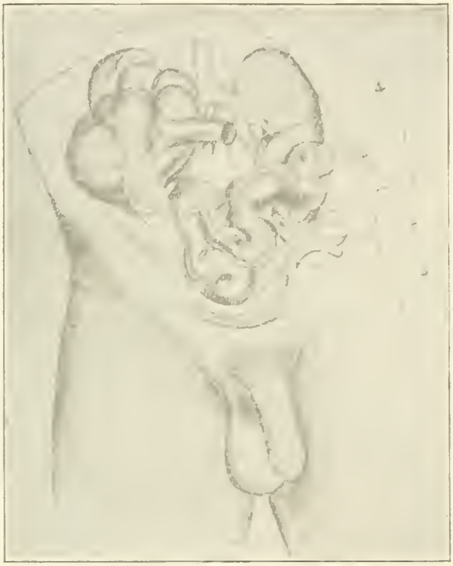

FIG. 1.—View of the iliac and pelvic colon: 1, the colon; 2, body of testis and epididymis; 3, the plica vascularis; 4, the spermatic vessels; 5, the plica gubernatrix.

In Figure 2 the rectum is seen cut in its entire length, and for the greater part of its extent its curvature is seen to be adapted to that of the sacrum and coccyx. The backward direction of the anal canal is well marked, and the internal sphincter which encircles it is very evident (6). Within the rectum a well-marked ridge of mucous membrane is seen, situated opposite the recto-vesical peritoneal reflection (9). This is one of the folds described by Houston as the " valves of the rectum." It is of a permanent character, not being obliterated when the bowel is distended. This fold, seen in the section lying on the right lateral aspect of the rectum, was named by Kohlrausch the " plica transversalis recti." It is also to be noted that at the anal canal the mucous membrane is arranged in a series of longitudinal ridges. These are the columns of Morgagni or the columnæ recti. When the

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[1] Fig. 1.—The body of the testis with the epididymis are connected to the iliac fossa by the mesorchium. From the upper border of this two folds of peritoneum are seen extending towards the intestine. The inner is attached to the gut, but the outer is observed to contain between its layers the spermatic vessels (4); this is the plica vascularis (3). (Lockwood.) From the lower border of the mesorchium another fold is seen extending towards the internal abdominal ring; this is the plica gubernatrix (5). From the base of the mesorchium the vas deferens can be observed passing into the pelvis. See Jacobson on "The Diseases of the Male Organs of Generation."

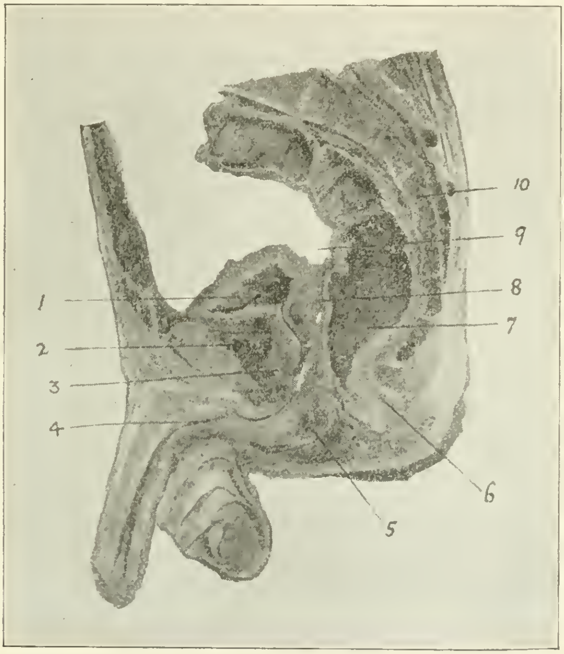

FIG. 2.—Mesial section through the pelvis of an adult male (Cunningham): 1, bladder; 2, retropubic pad of fat; 3, prostate; 4, urethra; 5, bulb; 6, internal sphincter; 7, rectum; 8, vas deferens; 9, peritoneal reflection; 10, sacrum.

bowel is distended they become obliterated. The bladder is nearly empty. Observe the sinking downwards of its superior wall following the escape of its contents; and also the level of the peritoneal reflection from it to the anterior abdominal wall, reaching almost to the symphysis pubis. The white rod has been passed through the common ejaculatory duct and the black rod lies in the sinus pocularis (uterus masculinus). The urethra has been cut in its entire extent. Observe the almost vertical direction it pursues in its prostatic stage.

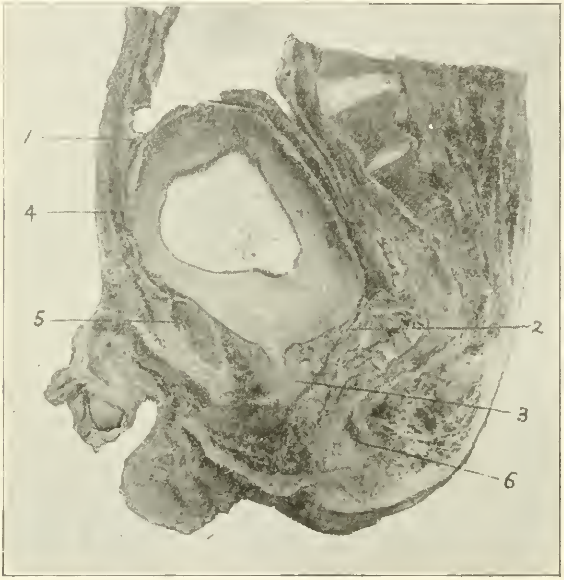

FIG. 3.—Mesial section through the male pelvis in which the bladder is greatly distended (Cunningham): 1, peritoneal reflection; 2, peritoneal reflection (recto-vesical); 3, prostate; 4, rectus abdominis; 5, symphysis pubis; 6, internal sphincter.

In the section shown in Figure 3 the rectum has not been cut in its entire extent as it has not followed the middle line accurately in its downward course. Note the reflection of peritoneum from the rectum to the bladder (2). It would appear in this instance at all events that distention of the bladder has not caused it to assume an appreciably higher level, thus contrasting in a very marked degree with the reflection from the bladder to the anterior abdominal wall, which has been raised for a considerable distance (1). On the other hand, when the rectum becomes distended, the recto-vesical reflection assumes a higher level, but this is not due to any change in the relative position of the bladder and peritoneum, but to the entire bladder with the reflection being pushed upwards and forwards by the loaded gut. (Cunningham.)

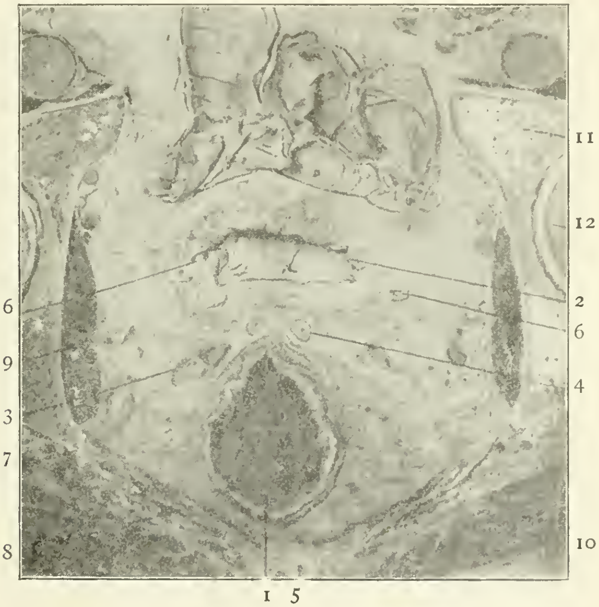

FIG. 4.—Horizontal section commencing immediately above the symphysis pubis in front and passing backwards with a slight inclination downwards (Cunningham): 1, rectum; 2, bladder; 3, seminal vesicle; 4, vas deferens; 5, coccyx; 6, ureter; 7, spine of ischium; 8, coccygeus; 9, obturator internus muscle; 10, glutæus maximus; 11, os innominatum; 12, head of femur in the acetabulum.

In Figure 4 the rectum has been cut in the suprasphincteric zone, and it is observed to lie slightly to the left of the mesial plane. The coccyx (5) appears on its posterior aspect and, on each side, the coccygeus muscle (8) extends outward towards the spine of the ischium (7). The anterior relations of the rectum also are to be noted. They are the seminal vesicles (3) which in this section are situated antero-laterally. The recesses in their interior are very distinct. Between the seminal vesicles and immediately in front of the rectum, observe the two vasa deferentia (4), each possessing a very thick wall and a very narrow lumen. Farther forwards the bladder (2) is seen in a very beautiful way; on its right side the ureter (6) is cut just before its termination, while on the left side it appears traversing the bladder wall. Within the bladder the inner opening of the urethra is very evident as well as the folds of mucous membrane radiating from it. This appearance may to some extent be due to the sphincteric action exercised by the prostate upon the urethra just at its commencement. The rugose character of the bladder mucous membrane is also well seen in this its flaccid condition. In front of the bladder are some coils of intestine. This relationship results

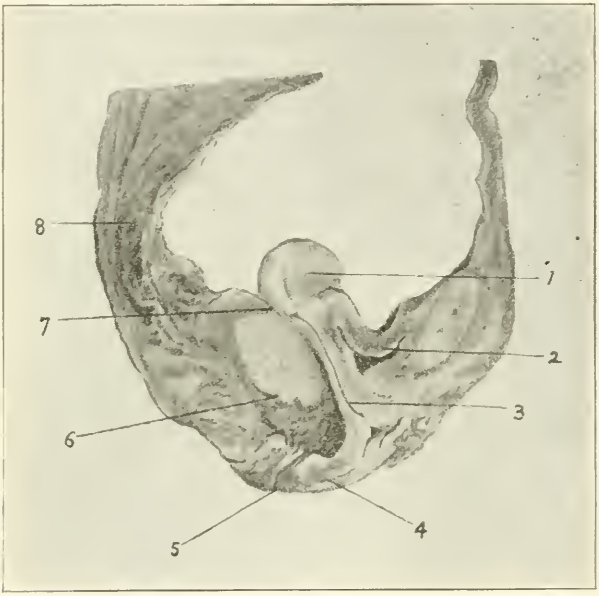

FIG. 5.—Mesial section through a female pelvis (Cunningham): 1, uterus; 2, bladder; 3, vagina; 4, perineal body; 5, anal canal; 6, rectal ampulla (suprasphincteric zone); 7, recto-vaginal pouch (Douglas); 8, sacrum.

from the empty condition of the former. For when the urine is expelled the superior wall of the bladder sinks downwards into the pelvis and upon its concave upper surface (Fig. 5, 2), the intestines rest. Consequently they have been implicated by the section. On each side, the obturator internus muscle (9) lies in relation to the inner aspect of the pelvic wall.

The rectum as seen in the section shown in Figure 5 presents a highly instructive appearance. Observe the contracted anal canal (sphincteric zone) directed downwards and backwards. The mucous membrane in its interior is arranged in a series of longitudinal folds which radiate from it at its upper extremity. The more capacious suprasphincteric region (6) is well marked. Note the very decided projection, in a downward direction, towards the perineum which is presented by its anterior wall just above the anal canal. Higher up the recto-vaginal pouch (7) is seen in front of the rectum. The uterus is anteflexed, and as it inclines to the right side the section in the upper part does not cut it into two equal and symmetrical portions. The empty bladder with the urethra in mesial section presents an outline resembling the letter Y, and the sinking downwards of the superior wall of the bladder is well seen in this, its empty condition.

The rectum, beginning opposite the third sacral vertebra where the mesentery of the pelvic colon ceases, is directed from behind forwards, and from above downwards, but does not invariably follow the middle line throughout, being sometimes slightly deflected to one or other side. (Figs. 3, 4, and 10.) Having extended beyond the tip of the coccyx, and down to where the levatores ani reach its sides (Figs. 6 and 7), its lumen becomes suddenly diminished, and bending upon itself here it is directed from before backwards (Figs. 2 and 5) to its termination at the anus. This terminal narrow portion is called the anal canal, and immediately above it the capacity of the rectum is at its maximum. (Fig. 5.) This part has received the name of rectal ampulla.

The posterior relations of the rectum are the same in both sexes. They comprise the lower part of the sacrum, and the coccyx, below which the rectum is applied against the levatores ani muscles and the ano-coccygeal raphe. (Fig. 7.)

The rectum, however, does not come into immediate relation with the sacrum, between them we find the presacral tissue in which are lodged some pelvic lymphatic glands together with the larger branches of the superior hæmorrhoidal artery. (Fig. 10.)

In front, the rectum at its commencement is invested by peritoneum, and when the bladder is empty it is usually overlaid by coils of intestine. In the male, the bladder when distended comes into relation with it (Fig. 3), and in the female, the uterus.

The subperitoneal portion of the rectum in the male forms the posterior boundary of the recto-vesical pouch ; in the female it bears a similar relation to the recto-vaginal pouch (pouch of Douglas). (Fig. 5.)

The anterior relations of the extraperitoneal portion of the rectum in the male are the base of the bladder (Figs. 2, 3, and 11), the seminal vesicles and vasa deferentia as they converge towards each other in front. (Fig. 11.) They are separated from the rectum, however, by a well-defined layer of fascia, the recto-vesical. (Fig. 11.) Then we meet with the prostate enveloped in its sheath (Fig. 12), and just below this the rectum takes its backward bend, and at its termination is separated from the bulb of the corpus spongiosum by an interval which has a triangular outline in mesial section. (Fig. 2.)

In the female, the anterior surface of the rectum in its extraperitoneal part is in relation to the posterior vaginal wall. (Fig. 5.) They are separated below, however, by a mass of tissue which has received the name of perineal body.

It is of considerable practical importance to remember that the connection between the rectum and vagina at their upper part is not at all intimate, so that they can be easily separated from each other during operation. This is much more difficult to accomplish lower down where a tough mass of tissue lies in front of the bowel. (Fig. 5.)[1]

We shall now proceed to study those muscles which collectively constitute the sphincteric apparatus of the rectum. They are the two sphincters and the levatores ani.

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[1] The photographs No. 2, No. 3, No. 4, and No. 5 were obtained by the kind permission of Professor Cunningham from frozen sections in the Anatomical Department, Trinity College.

The external sphincter (Fig. 8) is a voluntary muscle which surrounds the anus, arising behind from the tip of the coccyx and from the ano-coccygeal raphe. It divides into two portions which surround the anus in an elliptical fashion, meeting in front, where they are inserted into the central point of the perineum. Some of the superficial fibres are attached to the integument at the anterior and posterior extremities of the anus.

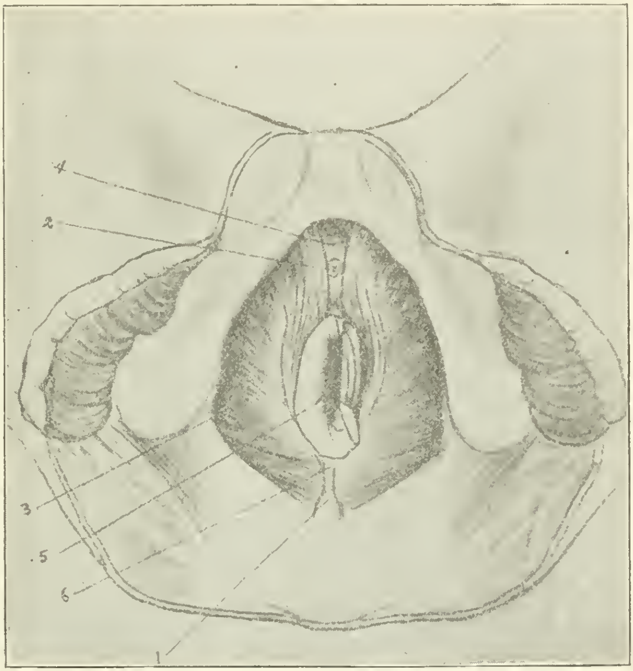

FIG. 6.—The deep surface of the levator ani muscle: 1, the coccyx; 2, the urethra; 3, the levator ani; 4, the prostate; 5, the anus (the terminal, extrapelvic portion of the rectum); 6, the ano-coccygeal raphe.

The internal sphincter is an involuntary muscle, of pale aspect, and of rather feeble power. It is formed by a thickening of the circular muscular coat of the rectum for about an inch at its termination, where it surrounds the anal canal. Its extent is well seen in Fig. 2.

Figure 6 has been taken from a specially prepared dissection, with the object of explaining the part played by the levatores ani in the sphincteric apparatus of the rectum.

As the fibres of each muscle proceed from their origins,—viz., the pelvic surface of the body of the pubis, the pelvic fascia, the inner aspect of the ischial spine,—they are seen to reach their insertions in the following manner: The posterior fibres pass downwards and inwards to the side of the coccyx. The anterior fibres take an antero-posterior direction to the lower end of the rectum, and do not, as is described in some anatomical text-books, meet the opposite muscle in a median raphe between the rectum and prostate. When they reach the rectum some of them take a downward direction, passing between the external sphincter and the outer longitudinal muscular coat of the bowel, and are attached to the skin at the anal margin. They constitute the true levator ani. The intermediate fibres have varying degrees of obliquity as they are directed towards the side of the rectum and to the median raphe between the tip of the coccyx and the anus.

Between the anterior borders of the two muscles, in front of the rectum, the urethra is seen emerging from the prostate (2, 4).

In addition to other structures, the external sphincter has been removed in this dissection, and on the left side that portion of the anus also has been removed which this muscle normally surrounds, in order to show the anterior fibres of the levator ani as they pass towards their insertion lying in relation to the rectal wall.

This dissection also shows how the two levatores ani muscles form, as it were, a muscular button-hole through which the rectum passes and by which it is laterally compressed. To put it briefly, when these muscles contract, the anus is raised; the lower part of the bowel (sphincteric zone) is constricted, and the suprasphincteric portion lying against the median raphe is drawn forwards.

Figure 7 has been drawn from one of the models prepared by Professor His (Leipzig).

The levator ani is seen on its pelvic aspect, its anterior fibres, not so well indicated as in the model itself, passing backwards beside the prostate (4) to reach the side of the rectum, the posterior fibres taking a more or less horizontal course to the side of the coccyx and the intermediate set sweeping backwards to the median raphe (6). The coccygeus (2) also is seen lying behind the levator ani, with the posterior border of which it is continuous. The lesser sacro-sciatic ligament lies farther back, continuous at its anterior (lower) border with the coccygeus muscle and its posterior (upper) border bounding the great sacro-sciatic notch. It is to be observed, also, how the levatores ani support the rectum below the coccyx. The portion of the rectum seen here (5)

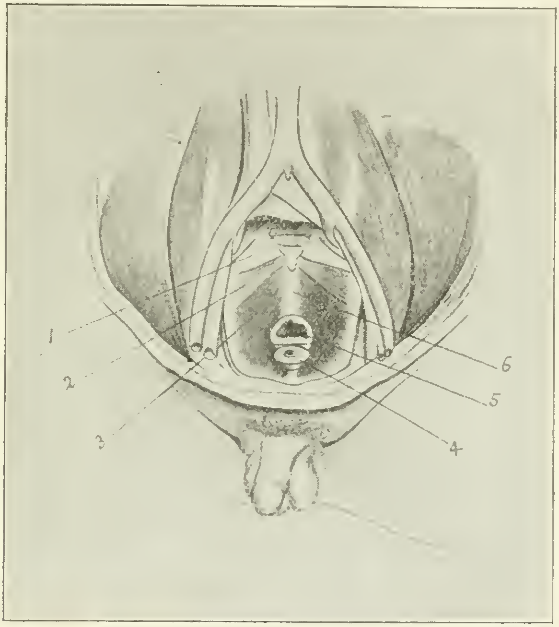

FIG. 7.—The pelvic diaphragm viewed from above: 1, lesser sacro-sciatic ligament; 2, coccygeus; 3, levator ani; 4, prostate; 5, rectum; 6, ano-coccygeal raphe.

is the dilated suprasphincteric segment (ampulla). This illustration also shows how the posterior aspect of the rectum can be exposed by incising the ano-coccygeal raphe. It is very evident, too, that if the lower part of the sacrum and the coccyx be re-

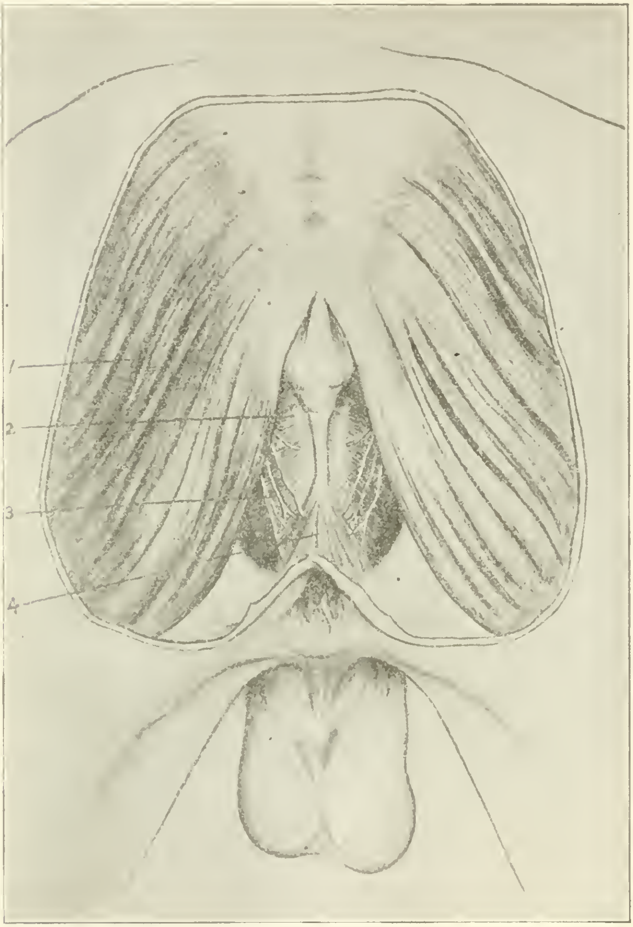

Fig. 8.—1, Glutæus maximus muscle; 2, levator ani; 3, inferior hæmorrhoidal vessels and nerves; 4, sphincter ani externus.

The black dots over the sacrum indicate the levels of the first, second, third, and fourth posterior sacral foramina. The subject was placed face downwards, and the lower extremities were allowed to hang over the end of the table while this and the three subsequent dissections were being made.

moved, as is recommended for some sacral operations, the pelvic diaphragm having lost its posterior attachments, will become relaxed, and the pelvic organs consequently will be badly supported.

It is very instructive to investigate the sphincteric apparatus of the rectum in the living subject. On introducing the finger into the rectum, the narrow anal canal can be made out, both as to its extent and tonicity, and above it one can easily identify the more capacious suprasphincteric region. Now it is often stated that the upper limit of the sphincteric zone felt in this way is caused by the internal sphincter. However, the sensation of constriction conveyed to the finger here is really caused by the levatores ani where they are in contact with the rectal wall. (Fig. 6.) Again, if we request the patient to contract the anus forcibly, it is easy to appreciate two contracting zones; a superficial one, which is due to the external sphincter, and one more deeply placed, which is both voluntary and sudden in its action, and which is, no doubt, constituted by the levatores ani muscles, and not by the internal sphincter whose contraction is slow and independent of the will.

Figure 8 represents one of a series of dissections which, by the kind permission of Professor Cunningham, I have been enabled to make in the Department of Anatomy, Trinity College, for the purpose of illustrating some points in the applied anatomy of sacral excision of the rectum. The glutæus maximus muscle (1) is seen on each side with its strongly-defined fasciculi. The inferior hæmorrhoidal vessels and nerves (3) are directed downwards and inwards through the ischio-rectal fossa.

In Figure 9 the glutæus maximus muscle (1) has been separated on each side from its inner attachments and turned outwards. The great sacro-sciatic ligament (5) is well seen on the left side, wide at its two extremities, but much narrower at its centre. On the right side it has been divided, and the two portions have been drawn aside so as to display the subjacent structures. It is not unusual to find this ligament pierced close to its sacral attachment by one or more arterial branches coming from the sciatic (7), and some of them may be of considerable size. It is worth bearing in mind that these may be cut during the separation of the soft tissues from the side of the sacrum in the course of operation and may bleed freely. On the right side the coccygeus (3) is

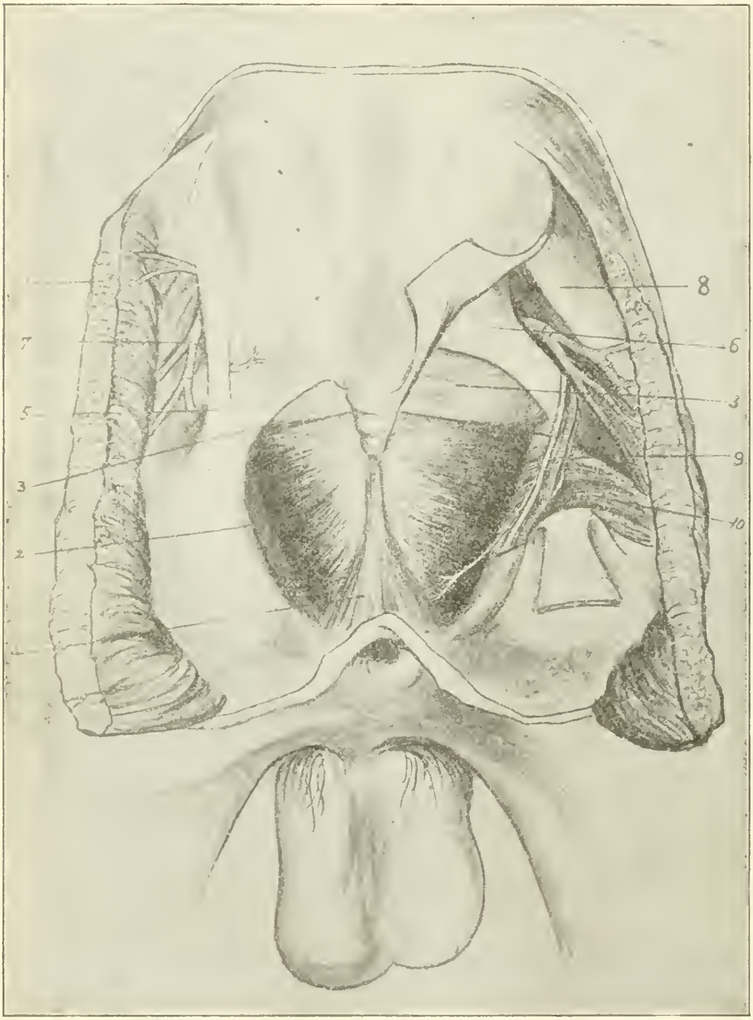

FIG. 9.—1, Glutæus maximus muscle; 2, levator ani; 3, coccygeus; 4, sphincter ani externus; 5, great sacro-sciatic ligament; 6, lesser sacro-sciatic ligament; 7, sciatic artery; 8, pyriformis muscle; 9, internal pudic artery and nerve; 10, the obturator internus muscle.

seen, continuous at its lower border with the levator ani (2) and at its upper border with the lesser sacro-sciatic ligament (6). It consists of a flat triangular sheet of fleshy and tendinous fibres which arises by its apex from the spine of the ischium and is inserted by its base into the border of the coccyx and lower part of the sacrum.

The lesser sacro-sciatic ligament (6) springs from the spine of the ischium and expands as it passes inwards to be attached to the sides of the last two sacral vertebræ. This ligament, together with the coccygeus, may, in reality, be said to form a single structure.

The internal pudic artery and nerve (9) appear crossing over the ischial spine, below which they lie in contact with the inner surface of the obturator internus muscle (10) and pass from view beneath the obturator fascia.

The inferior hæmorrhoidal nerve is seen emerging with the internal pudic at the great sacro-sciatic foramen and running for a considerable distance with the parent trunk before passing inwards across the ischio-rectal fossa to reach the external sphincter which it supplies.

In Figure 10 the sacrum has been cut transversely between the third and fourth sacral foramina and the lower part of the sacrum with the coccyx has been removed. The pelvic fascia (5) was then exposed as a loose membranous layer concealing the rectum from view. It was freely incised and its edges were held widely apart, as seen in the illustration. The middle hæmorrhoidal artery (9), which is seen piercing it, was observed to come off from the sciatic artery on both sides. In defining the rectum and the arterial branches which ramify upon it, a considerable quantity of fatty tissue had to be removed as well as several lymphatic glands. The two main branches of the superior hæmorrhoidal artery (7) are seen as they flank the rectum on each side, and their subdivisions spreading over the muscular coat of the bowel before piercing it, to reach the submucous layer. The rectum, which had not previously been disturbed in any way, was found at this point to take a well-marked curve to the right (6). The pelvic peritoneum (8) is seen bulging backwards to the left of the rectum. It is interesting to note the small size of the sacral canal (10) as compared with the entire cut surface of the bone. The middle sacral artery (11), which is sometimes of considerable size, may, when the sacrum is cut across,

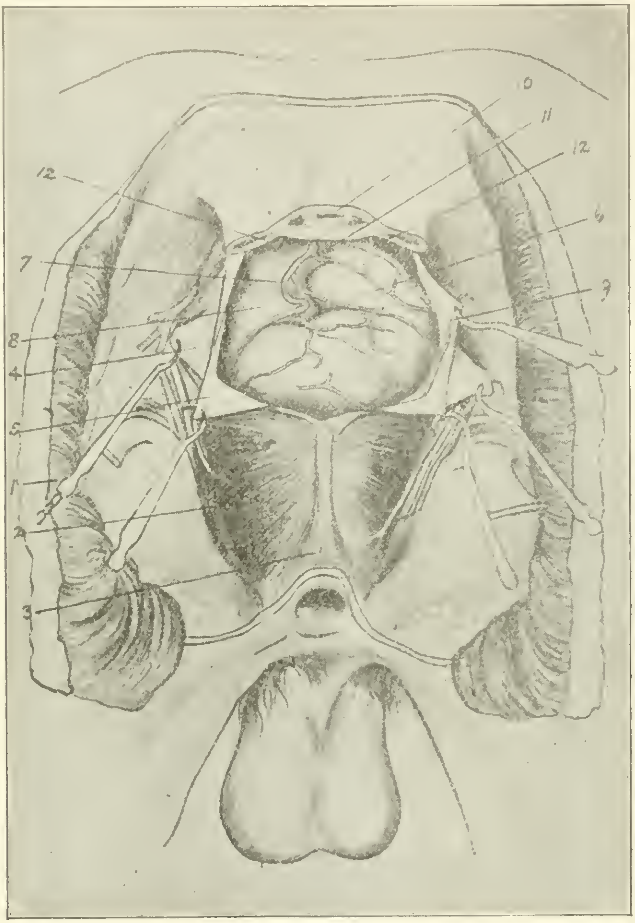

FIG. 10.—**1**, Glutæus maximus muscle; 2, levator ani; 3, sphincter ani externus; 4, the lesser sacro-sciatic ligament (separated from sacrum and drawn outwards); 5, the pelvic fascia; 6, the rectum; 7, superior hæmorrhoidal artery (left main division); 8, the pelvic peritoneum; 9, middle hæmorrhoidal artery; 10, the sacral canal; **11**, middle sacral artery; **12**, lateral sacral artery.

give rise to smart hæmorrhage, and this is sometimes difficult to control, owing to the close manner in which the vessel is applied to the bone. The above site of bone section is that recommended by Bardenheuer in sacral excision of the rectum (p. 418). It affords free access to the pelvis owing to the large breach made in its posterior wall, extending, as it does, from one ischial spine to the other.

In Figure 11 the levatores ani muscles were separated from each other in the middle line down to a point near the anus. The two segments of the pelvic diaphragm were then retracted laterally, as seen in the illustration. A piece of the rectum, about two inches in length, was removed and the distal end was allowed to hang downwards over the anus.

The anterior relations of the rectum were thus exposed. The bladder was moderately distended with air beforehand.

The ureters (5) are seen as they lie in relation to the bladder close to their terminations, and just here they are overlapped by the posterior rounded extremities of the seminal vesicles (7). These latter, possessing an irregularly sacculated contour, approximate each other as they extend forwards towards the base of the prostate, lying between the extraperitoneal portion of the base of the bladder and the pelvic fascia (recto-vesical layer) (8). The vas deferens (6) is seen on each side running along the inner margin of the corresponding seminal vesicle and gradually approaching the middle line in front. Near its termination each vas is seen to assume a dilated appearance. Between the vasa deferentia is seen the extra-peritoneal portion of the base of the bladder which is in relation to the rectum and which corresponds to the triangular area in the interior of the bladder called the trigone, the base of which is formed by a line connecting the orifices of the two ureters and its apex at the inner opening of the urethra. The middle hæmorrhoidal arteries (2) are seen piercing the pelvic fascia on each side so as to reach the rectum. In the course of the dissection some of their branches were observed to anastomose with others of the superior hæmorrhoidal as they lay in contact with the muscular coat of the rectum.

The recto-vesical layer of the pelvic fascia (8) has in part been preserved. It is seen to form a well-defined layer between the seminal vesicles and bladder in front and the rectum behind.

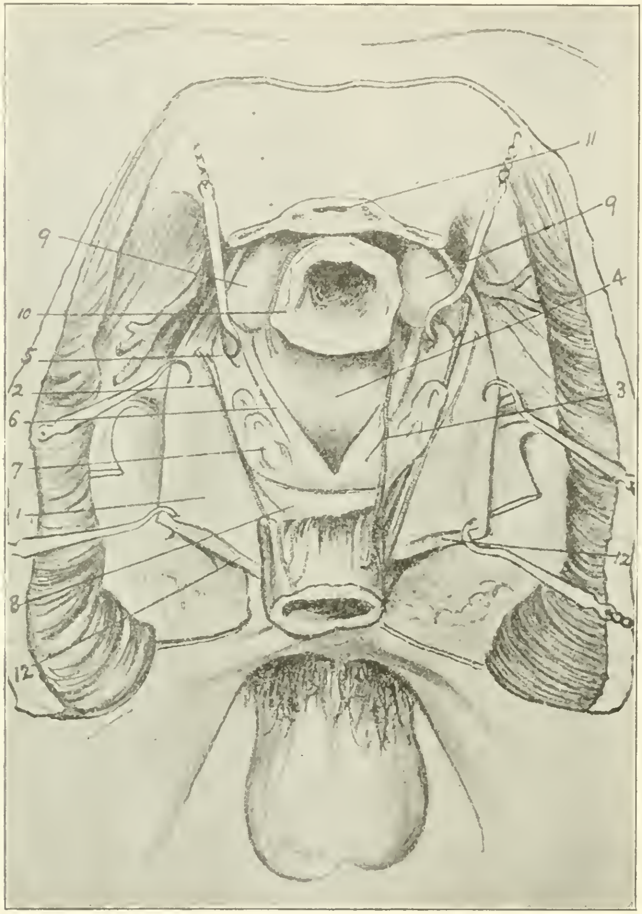

FIG. 11.—1, pelvic fascia clothing the upper surface of the levator ani; 2, middle hæmorrhoidal artery; 3, superior hæmorrhoidal artery (right division); 4, the bladder; 5, the ureter; 6, vas deferens; 7, seminal vesicle; 8, pelvic fascia (recto-vesical layer); 9, the pelvic peritoneum; 10, the rectum; 11, the sacral canal; 12, cut surface of the ano-coccygeal raphe.

When traced in a downward direction this fascia is found to be continuous with the posterior part of the prostatic sheath. Between it and the rectum there intervenes some loose areolar tissue, and separation of the bowel is readily effected here. This fascia also, as it extends across in front of the rectum, binds the vesiculæ seminales and vasa deferentia to the base of the bladder, as can be well seen in this illustration.

This dissection, shown in Figure 12 has been prepared to illustrate the applied anatomy of perineal excision of the rectum. The subject was placed in the lithotomy position with the buttocks well raised. A median incision was made, starting behind the anus and extending backwards over the coccyx. It was gradually deepened through the ano-coccygeal raphe (Figs. 6 and 7) until the posterior aspect of the rectum was exposed. With the finger introduced into the wound it was quite easy to define its lateral aspects as well. By means of stout scissors the anus was encircled by an incision, which, commencing behind, separated

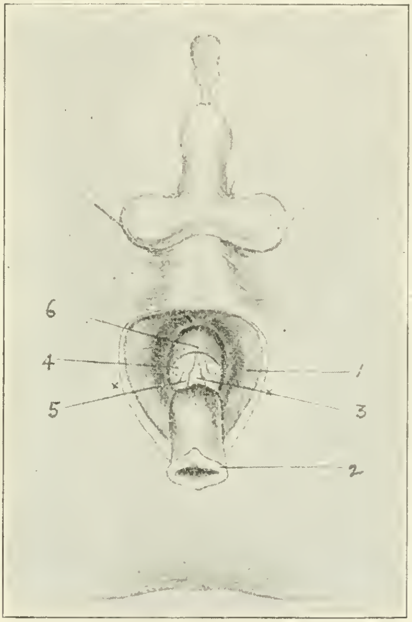

FIG. 12.—1, levator ani; 2, rectum with the anal integument; 3, bladder; 4, seminal vesicle; 5, vas deferens; 6, prostate.

the levatores ani all round from the bowel (2). The edges of the wound at the points x, x′ were well retracted, and the further separation of the rectum proceeded with in front, a sound meanwhile being introduced into the bladder. Finally, the rectum was drawn backwards into the coccygeal angle of the wound. The levatores ani have been everted as fully as possible. The anal integument, together with the external sphincter, remain connected with the rectum. This dissection shows very well the anterior relations of the latter,—viz., the bladder, 3; seminal vesicles, 4; vasa deferentia, 5; and prostate, 6.

The recto-vesical fascia (Fig. 11, 8) had to be removed so as to display the seminal vesicles and vasa deferentia.

II. Operative Considerations.

The radical treatment of rectal cancer is a matter upon which opinions widely differ. Mr. Watson Cheyne,[1] in his recent lectures on the objects and limits of operation for cancer, does not appear to regard it in a very favorable light. One of the chief arguments put forward is, that in operations for the radical cure of cancer anywhere in the body, the parts removed should include not merely the primary seat of disease, but in addition the nearest lymphatic glands, no matter whether they show signs of disease or not, together with the cellular tissue in which their afferent lymphatic vessels run. It is stated that in the removal of rectal cancer this cannot be carried out in the same complete way as is possible in breast cancer, for instance. This I grant to a certain extent, but, nevertheless, I would not on that account be disposed to take too desponding a view. It is a well-known fact that with rectal cancer metastases are often late in occurring, and in connection with this point Iversen states that in forty-seven post-mortem examinations of long-standing diseases he found twenty-one in which there were no metastases. Besides, we know that even if some infected glands remain behind, the subsequent progress of the disease in them may be extremely slow and may not give rise to serious symptoms for a long time.

[1] Lettsomian Lectures, 1896.

The suffering, too, from glandular recurrence is not nearly so great as from the primary disease, if allowed to advance unchecked.

Examples of prolonged life after rectal excision are far from being rare. Many cases have been recorded both in our own country and abroad of non-recurrence after six, eight, and even ten years. These facts are certainly encouraging, and even if radical cures were obtained only in a small percentage of cases, much better would it be to operate than to leave to their miserable end patients affected with this awful disease. Early recurrences, however, have frequently given rise to disappointment. In such cases it would probably be more correct to say that the cancer continues rather than recurs; in fact, that the operation has not succeeded in removing the veritable limits of the disease. The lesson to be learnt from this is that we cannot be too careful as regards the indications for operation, and that we expose ourselves to a perfectly useless task when we operate upon rectal cancers which are not suitable for wide removal.

The mortality attending rectal excision has been considerable, varying from 20 to 25 per cent. This, of course, refers to the sacral operation. More recent results, however, show a marked improvement. Czerny's mortality only reaches 5.4 per cent., perineal; sacral, 19.4 per cent.; Iversen, 25 per cent.; Albert, 18 per cent.; Ball, 8 per cent.; and Paul, 14 per cent.[1] I am strongly convinced, however, that the high mortality hitherto exhibited in the records of rectal excision will markedly diminish, and that it will be accomplished by a judicious selection of cases, by minute attention to pre-operatory and post-operatory details, and by a more perfect technique.

The bad functional result sometimes following rectal excision has been used as an argument against it. No doubt in many cases operation leaves much to be desired both as regards continence and stricture with its unpleasant consequences, yet it has often been observed that even though the sphincters have been excised, a fair amount of control may remain, except during attacks of diarrhœa. Modern methods of treatment, too, as I hope to show later on, have done much towards preserving the sphincteric apparatus of the bowel in a functional condition.

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[1] Lancet, February, 1895, p. 488.

When a patient suffering from rectal cancer comes under observation the first question which suggests itself to our minds is, Is it possible to attempt a radical cure? If so, what procedure should we adopt for this particular case?

Let us consider, then, what are the indications which would warrant operation.

These are essentially connected with the various methods and technique at our disposal. Formerly only those cancers situated very low down were considered suitable for removal; however, modern methods have considerably enlarged the scope of surgical intervention, and whereas the peritoneal cul-de-sac in years gone by formed an absolute line of demarcation between those rectal neoplasms upon which one might operate and those which should not be touched, nowadays this barrier has fallen, and for a certain class of cases the opening of the pelvic peritoneum is a foreseen event and the method for approaching the disease. The operation of Kraske and its modifications have widely extended the field of operation, for by it cancers, involving not only the upper part of the rectum but also the adjacent portion of the pelvic colon, may be reached and removed.

The extent of the disease must, above all things, be considered as the main indication for or against its removal. It is essentially small and movable cancers which are best suited for the radical operation; those, in fact, which remain confined to the rectal wall, modifying in no way its connections and its mobility. We should in every case endeavor to make out the extent of the growth; if it has invaded the surrounding cellular tissue, glands, seminal vesicles, prostate, bladder, uterus, vagina, or the sacrum. This is not always an easy matter to decide, as some cancers which appeared quite mobile and without glandular enlargement may reveal themselves quite otherwise during the operation. Therefore repeated and careful examinations should be made. It is to be deplored that rectal cancer is seldom diagnosed early, probably owing to the fact that it has a latent period of variable duration and an indolent course in its early stages. Frequently, too, the medical attendant is to blame for not having practised a careful examination and for having allowed the disease to progress for months unnoticed.

As influencing operation, the general state of the patient is of the greatest importance; age, weakness from loss of blood, and the condition of the viscera, especially the kidneys, must also be taken into account. As a distinguished French surgeon[1] has observed, "It is worth bearing in mind the important equation which surgery obliges us to observe between the resisting power of our patients and the gravity of the surgical procedure. Such is a difficult matter, for not only must they resist the traumatism which we inflict, but to a varying extent also a degree of infection which our methods of rectal excision are often powerless to avoid. Many of the deaths from shock are probably the result of rapid septic intoxication in subjects more or less debilitated."

The preparatory treatment must next be considered. We should leave nothing undone to insure the success of the operation, and, as Morestin[2] advises, the two main indications are to improve the general condition of the patient and to diminish the septicity of the intestine.

The general state of the patient is often most unsatisfactory and leaves much to be desired, especially in those of the poorer classes. When such is the case, a few days' careful feeding may do a great deal. As articles of diet, milk and eggs may be given freely, and in addition a moderate amount of stimulants will have a beneficial effect. We cannot be too careful in our attempts to increase our patient's store of strength and resisting power.

Our second endeavor is to diminish the septicity of the intestine. Of course, there is no known way of rendering the digestive tube aseptic, and it is useless to assert that it is a feasible thing in practice. We cannot expose it to the influence of strong antiseptics or other powerful measures, but must rely on milder means.

In our surgical text-books and monographs upon this special branch of surgery there is but scant attention directed towards the antiseptic and aseptic technique in rectal excision, and I am of the opinion that the precautions taken in many cases are of a very imperfect nature.

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[1] Quénu, Bulletins et Memoires de la Société de Chirurgie, Paris, Tome XXII, p. 271.

[2] Des Operations qui se pratiquent par la Voie Sacrée, Paris, 1894.

To begin with, purgatives are certainly indispensable, but it is not well to be too severe in their administration, as they tend to weaken the patient, and this we must especially avoid. Sulphate of soda or magnesia answers well for the purpose. There is not much doubt that purgation is more efficacious in cleansing the intestinal tract than the entire host of antiseptic drugs employed for the purpose. However, I think there are some which may be taken with advantage,—viz.,—

Resorcin, Salicylate of Bismuth, and Salol. They should not be administered in large doses, as they are not well borne by the stomach. I cannot be too emphatic as to the necessity for a thorough cleansing of the rectum. Its lumen is often considerably narrowed at the seat of disease, and fæcal masses of firm consistency tend to collect, and purgatives may fail to dislodge them. They must be reached from below. Besides, virulent micro-organisms swarm upon the ulcerated surface and every effort must be taken to remove or destroy them. Proctitis, too, is often very evident in the vicinity of the growth. To combat these conditions satisfactorily, we must, in the first place, employ frequent and prolonged rectal irrigation. It should be carefully done, either by the surgeon himself or by a skilled assistant. The best fluid probably is warm water. It should be injected for some distance up the bowel above the stricture. This may be difficult or even impossible if the latter is narrow and highly placed. A soft and flexible rubber tube is the best for the purpose, and the method which I adopt is essentially the same as that so strongly advocated by Sir Thornley Stoker[1] for emptying the large intestine of its contents,—that is, to pass a soft tube into the rectum and, if necessary, through the stricture. Its outer extremity is connected with a second tube to one end of which a funnel is attached. This is raised a few feet above the level of the bed and warm water or boracic solution is poured in until the patient experiences a feeling of discomfort. When the water or solution has been retained a few seconds, the funnel and tube are lowered and the water from the bowel flows into a vessel beside the bed. These rectal flushings should be carried out morning and evening for at least four or five days before the operation. If we were to stop here, I am afraid we would only to a very slight extent attain our object, for purgation, intestinal antiseptics, and rectal irrigation can never do more than moderately disinfect the field of operation, so long as there exists an ulcerating cancerous surface. The most satisfactory way I believe to combat this is by the curette. From my own experience I can speak highly of its effects. The friable surface of the growth is easily removed ; the bleeding is trivial and soon ceases. I employ the flushing curette and dilate the anus freely. During the proceeding, free exit is afforded to the stream of water and cancerous *débris*. This is done, of course, immediately before the removal of the growth. Before leaving the subject of preparatory treatment, I must allude to preliminary colotomy. It was in consequence of the unpleasant results so frequently following Kraske's operation that this procedure was adopted by many continental surgeons, as well as by some in this country. Many fatalities have resulted from peritonitis and pelvic cellulitis, and circular suturing of the bowel has rarely succeeded. Fæces coming into contact with the line of union may do great harm. More especially if of firm consistency, they put tension upon the sutures or produce rents in a newly-formed cicatrix and at the line of suture they deposit large numbers of infective organisms, which by their injurious effects would tend greatly to interfere with rapid and sound union. Quénu,[1] in a recent paper, is very decided in his opinion respecting preliminary colotomy. He performs it twelve days before the rectal excision, and lays great stress upon the fact that in the course of this operation one may explore the pelvic cavity and ascertain the condition of the lymphatic glands as well as that of the pelvic colon, as to its mobility or involvement by disease.

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[1] Presidential Address, Surgical Section, Royal Academy of Medicine, Ireland. (See British Medical Journal, January, 1895, p. 186.)

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[1] Société de Chirurgie, Paris, July, 1896.

To put it briefly, the results aimed at by those who advocate preliminary colotomy are, in the first place, to facilitate a more thorough disinfection of the rectum by means of free irrigation and diversion of the fæces. Secondly, to diminish as far as possible the chances of infection after the operation.

Many objections have been urged against it; the following are the more important. Between the colotomy and the major operation several days must elapse. This delay may be too long, and is hardly justifiable when it is a question of a curative operation. The patient's condition also may deteriorate between the two operations; in other words, the major operation comes upon him before he has returned to his normal state and finds him in a condition of low resistance. Again, if the patient recovers from the rectal operation he must submit to have the artificial anus closed, and that, too, at a time when he may not by any means be in a condition for such extensive surgical interference. A preliminary colotomy may create a considerable difficulty in Kraske's operation by preventing the drawing down of the intestine. This is most likely to occur in cases where, owing to distention with gas and fæces, the pelvic colon having risen out of the pelvis presents at the abdominal wound and is fixed there. This occurrence may render the subsequent drawing down of the bowel difficult, if not impossible.[1]

I have not adopted the procedure in any of my cases of rectal cancer; and, although I consider it to have certain advantages, yet they are not sufficient to induce me to carry it out as a routine practice. The chief inducement which might lead me to undertake it would be failure to empty the bowel above the stricture by other means and to cleanse satisfactorily the field of operation.

Before attempting to remove a rectal cancer, it is always well to determine what mode of intervention is best suited for the case. For this purpose it would be well to consider as to their site and extent a certain number of types of cancer and then decide upon the special operative procedure suitable for each one of them. I adopt Quénu's classification; he formulates four types.[1]

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[1] Morestin, loc. cit.

(1) Cancers placed low down, having started below the attachments of the levatores ani,—in other words, anal cancer.

(2) Those which lie above the levatores ani, in the suprasphincteric zone of the bowel and infraperitoneal.

(3) Those placed high up, their lower limit about at the level of the peritoneal cul-de-sac, and from this extending upwards so as to reach and perhaps involve the lower portion of the pelvic colon.

(4) Cancers which extensively involve the rectum, reaching from the anus for a considerable distance upwards.

It is to be borne in mind that every radical operation for rectal cancer embraces two successive acts; these are the excision of the diseased part and an attempt at functional repair.

The Operative Treatment of Anal Cancer.—The skin having been cleansed, shaved, and the surface of the growth curetted, the rectum is irrigated and an incision is made in the skin well free of the disease, the external sphincter being of necessity removed. With stout scissors the dissection is continued upwards until healthy tissue is reached above the growth. When this has been removed, deep sutures are passed from the skin, beneath the cut surface of the wound and out through the mucous membrane. They have the good effect of stopping bleeding and at the same time closing the wound in a very complete way. A few superficial catgut sutures may, if necessary, be inserted for the more accurate adjustment of skin and mucous membrane. It is a great advantage to obtain primary union, otherwise the raw surface between the skin and mucous membrane in the process of healing will contract, and form a stricture which may be a great source of annoyance. The inguinal glands should always be examined when cancer affects the anal integument, and if found enlarged they should be removed.

Suprasphincteric Cancer.—For this class of cases the important question to determine is, Does the growth in the suprasphincteric region involve the sphincters too, or remain free of them? This has much to say both to our mode of attack and to subsequent functional repair.

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[1] Presse Médicale, November, 1895.

For both classes of cases the perineal operation is the one which has been and is still most frequently practised. As described in our surgical text-books it shows many grave defects. For instance, Mr. Allingham does not make any allusion to the mode of dealing with the levatores ani, even in the last edition of his work.[1] To my mind this is about the most important step of the operation, and has much to say not only to the proper removal of the disease, but to the subsequent restoration of sphincteric action. Perineal excision of the rectum as it has been performed and as it is still described is a bloody and barbarous procedure. One thing I am certain of, and it is that a thorough appreciation of the anatomy of this region is indispensable if the operation is to be conducted on anything like a scientific basis. I plead for accurate anatomical knowledge here no less than elsewhere. It is the surgeon's true guide, without it, he wanders vaguely, and his steps are directed more by chance than by sound reason. His methods of operating as well as his results will, I think, prove the force of my argument.

What then are the best means of dealing with cancer involving the sphincteric zone and reaching for some distance above it? It appears to me that the best method is as follows: Begin by a median posterior incision behind the anal margin and extend it backwards in the middle line over the coccyx. Then starting from the tip of this follow the median *raphe* forwards, splitting the posterior part of the external sphincter and separating the levatores ani. (Figs. 6 and 7.) On introducing the index-finger into the wound, the rectum is easily cleared on its posterior and lateral aspects. Strong blunt-pointed scissors are now taken, one blade is placed in the wound just behind the anus and in the interval between the rectum and the levator ani, the other blade rests upon the skin. The bridge of tissue between the blades is now cut, and a similar section made upon the opposite side. These lateral incisions are extended towards the middle line in front cutting the levatores all round from the rectum. (Fig. 12.) It remains now to free the rectal tube in front.

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[1] Diseases of the Rectum.

In the female, an assistant's finger should be placed in the vagina, and in the male a sound should be passed into the bladder to give warning of approach to these parts as the dissection is proceeded with. When the upper limit of the disease has been reached, and before cutting the rectum across, it is well to free it somewhat, so that the upper healthy mucous membrane may afterwards be brought down to the skin and fixed there without undue traction. A pair of forceps or an elastic ligature is then placed about an inch above the growth and the rectum is cut across well wide of it. If it is not possible to fix the gut at the site of the normal anus, it may be drawn backwards in the middle line between the levatores ani and a subcoccygeal anus formed. The wound in front is then closed by deep sutures. As Mr. Ball[1] points out, they have the great advantage of not leaving recesses about the rectum in which serum might collect and decompose. These deep sutures should, of course, include the levatores ani; our object being to reconstruct a sphincteric apparatus. (Fig. 12.)

Throughout this operation every precaution should be taken to control bleeding, which is often profuse and may be serious. I am strongly of the opinion that the lightning rapidity of operating, recommended in some of our text-books, should be condemned, being both unnecessary and dangerous. Forcible tearing of tissues with the finger, and rapid separation of the growth at all hazards are not in keeping with the surgical principles of the present day. Also, I am convinced that every attempt should be made to attach the gut to the skin. If there were much difficulty in doing so, it would be better to adopt the method of Verneuil, and resect the coccyx so as to form a presacral anus. By doing this we avoid as far as we can the infection of a large open wound and the inevitable stricture which would follow the process of healing.

When the disease is quite above the sphincteric zone, this should not be interfered with. The directions given in most text-

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[1] Diseases of Rectum and Anus.

books for its preservation do not correspond with the rules of conservative surgery. What we usually find recommended is to make deep incisions into the ischio-rectal fossæ on each side, so as to leave the external sphincter attached to the skin. If we adopt such a course, I would like to know what becomes of the nerves which supply this muscle. It would appear to me that these could hardly escape being cut. The levatores ani would also be separated from their lateral attachments to the rectum, and this on no account should be done. The proper course to pursue after making the median posterior incision from the anal margin backwards and exposing the posterior and lateral aspects of the rectum is to cut it across above where the levatores ani reach its sides. (Fig. 6.) The propriety of this step has been already insisted upon by Mr. Heuston,[1] of Dublin. When the cancerous portion has been removed, the upper healthy segment having been set free, is drawn down and fixed to the anal mucous membrane. Mr. Heuston, in addition, advocates some fixation sutures higher up between the rectum and the levatores ani, so as to diminish the strain upon those lower down. The posterior part of the wound is closed by deep sutures involving the same muscles.

The perineal method for excising cancers situated above the sphincteric region does not appear to me to be altogether satisfactory for the following reasons:

(1) It does not allow sufficient room. Anybody who has had experience of the operation is aware of the fact that it is far from easy to dissect away the diseased intestine, to reach the healthy part above it, and draw this downwards towards the anus. In the confined space it is difficult to see what we are cutting. This refers especially to the tissue in front of the sacrum and coccyx; it forms one of the supports of the rectum, holding it in place and impeding its descent. To treat it satisfactorily one would require more room than that afforded by the perineal route.

(2) Hæmorrhage is often free and may not be easy to control. In connection with this point, Heidenhain[2] observes, in a

[1] British Medical Journal, 1895, p. 1141.

[2] Fortschritte der Medicin, No. 2, 1896.

recent paper on sacral excision, "The survey of the field of operation, the differentiation of the diseased from healthy tissue, and the control of hæmorrhage are materially better than in the old perineal operation."

(3) The restoration of sphincteric function after perineal excision has been very imperfect. This has been due partly to the defective methods of operating to which I have already alluded, and partly to the failure often experienced in bringing the bowel down so as to suture it to the anal mucous membrane. In many cases the sutures have torn through, as the result of excessive tension, and allowed the bowel to retract, thus leaving an extensive surface to heal and form a stricture.

To obviate these disadvantages I prefer the sacral method of approach for the majority of cancers in the suprasphincteric region of the rectum.

It is extremely interesting in connection with this disease to observe the progressive series of operations which have been employed from time to time for its removal. Lisfrance and Dieffenbach only attempted the anal method. In order to get more room Denonvillier made the median posterior incision, and later on Verneuil removed the coccyx. Then as the result of Kraske's operation combined with modern advances in antiseptic and aseptic methods, the limits of interference markedly widened, and to-day we do not hesitate to perform operations which in the past would have been considered unjustifiable and unsound. Kraske had not to take a great surgical bound; his operation was in reality but one step onward.[1] To him, however, the honor is due of having been the first to suggest the sacral method for rectal excision, and to carry it into execution. Kraske's operation has two main objects in view.

(1) To procure a means of free access to the disease; (2) to remove it, and at the same time preserve the sphincteric function of the rectum.

The details of the operation have been more or less modified by different surgeons. Some have directed their attention to the means of gaining access to the pelvic cavity. Others have sought to improve the methods of dealing with the rectum. The great number of modifications, no doubt, owe their existence to the many unsatisfactory results which have been obtained. With Kraske's operation has been associated a high mortality, deaths from shock and peritonitis have been frequent. Besides, in many of those who survived the operation, the consequences, both immediate and remote, have caused much disappointment. I may mention such accidents as cellulitis, abscess, fistulæ, fæcal incontinence.

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[1] Morestin, loc. cit.

The sacral operations as now practised may be divided into three groups.[1] (1) Definitive sacral resection ; (2) temporary sacral resection ; (3) parasacral incision.

Sacral Resection.—This was the operation of Kraske, and it was performed as follows :

The patient lies on the left side ; a median incision is made, commencing about the middle of the sacrum and ending just behind the anus. The back of the sacrum and coccyx having been exposed, the tissues are separated from them on their left border. The coccyx is disarticulated and a portion of the left side of the sacrum is removed. The line of bone section takes a curved course, beginning below the third sacral foramen, arching inside the fourth and terminates at the lower border of the fifth sacral vertebra.

This is the preliminary part of the operation. It affords access to the cavity of the pelvis. The next step is to free the rectum and remove the growth. In doing this, Kraske tried to avoid opening the peritoneal cavity, but he observed that if it were opened, the subsequent drawing down of the intestine was rendered easier. The diseased segment is isolated and removed. At first Kraske united the two healthy ends by circular rectorrhaphy, but many mishaps followed, such as failure of union, peritonitis, and perirectal cellulitis. He then gave up circular suturing and united the ends in front only, leaving a gap behind which might be closed later on by a second operation.

Undoubtedly the crucial point in this operation is the union of the two divided ends of the intestine. It is here that we are most frequently exposed to failure and disappointment. The conditions for union are not at all so favorable as where two peritoneal surfaces or peritoneal and muscular surfaces are brought together. When two muscular layers come into apposition, apparently they do not unite so quickly and the union is more easily undone.

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[1] Chaput, Thérapeutique chirurgicale des Affections du Rectum, Paris, 1896.

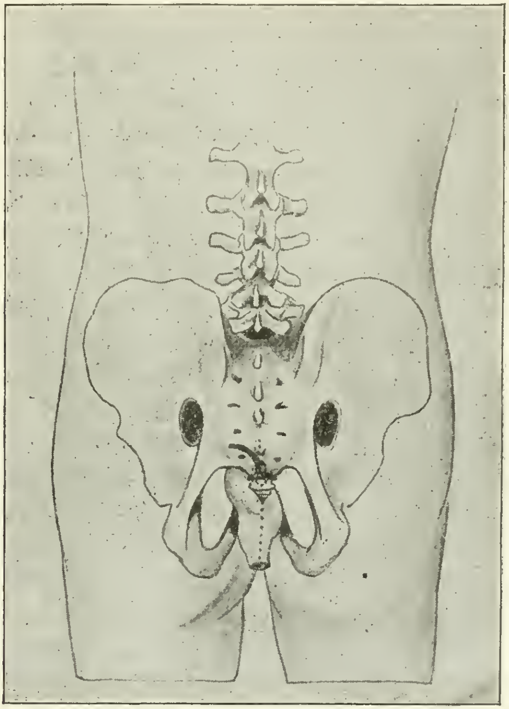

FIG. 13.—Line of sacral excision after Kraske.

Hochenegg,[1] of Vienna, modified the operation in the following way: His skin incision was oblique. Starting opposite the left sacro-iliac articulation, he directed it across the middle line of the sacrum, followed the right border of the coccyx, and ended just beyond its tip. He then removed the coccyx, but made a somewhat more extensive sacral section than Kraske. It commenced on the left side below the third sacral foramen, curved

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[1] Wiener klinische Wochenschrift, 1889, Nos. 26–30.

inward across the middle line, and ended at the lower border of the sacrum on the right side. Having found Kraske's method of connecting the two ends unsatisfactory, he proposed a new device, which was to draw down the upper segment into the lower and fix it by temporary sutures at the anal margin. After a few days these were cut and the intestine was allowed to retract and occupy its proper place. The following objections may be urged against it:

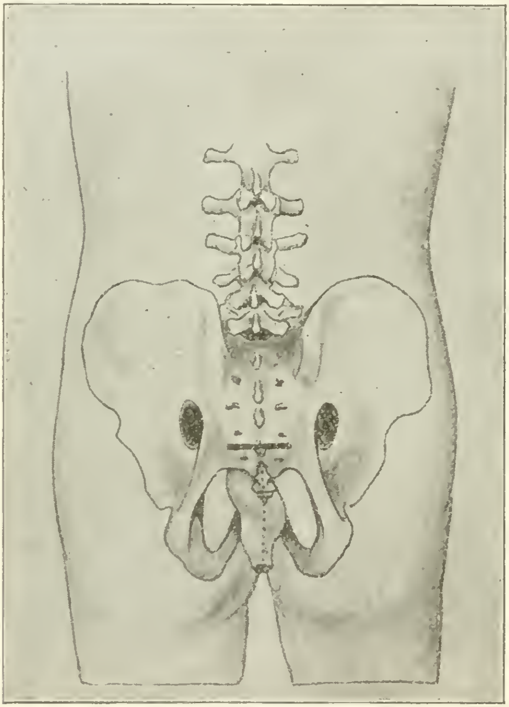

FIG. 14.—Sacral excision after Bardenheuer.

(1) It might not be easy or possible to draw down the upper end to reach the anus without compromising its vitality or exercising excessive traction.

(2) When the upper segment is set free or tears itself away, it may fail to reach the desired limit. It may stop on the way or it may mount too high. This latter occurrence might and has led to obstinate stricture later on.

Bardenheuer[1] did not consider the sacral section of Kraske extensive enough, and in order to gain more room he cut the bone across below the third sacral foramina. (Fig. 14.) The pelvis was thus widely opened by a wide breach between the two ischial spines. However, the fourth pair of sacral nerves are destroyed, and unless care is taken the anterior divisions of the third pair may be implicated also. It would be a great misfortune if this were to occur in consequence of its results upon the sphincteric function of the rectum, for both the levatores ani and the external sphincter would be paralyzed, and that of the bladder also similarly affected.

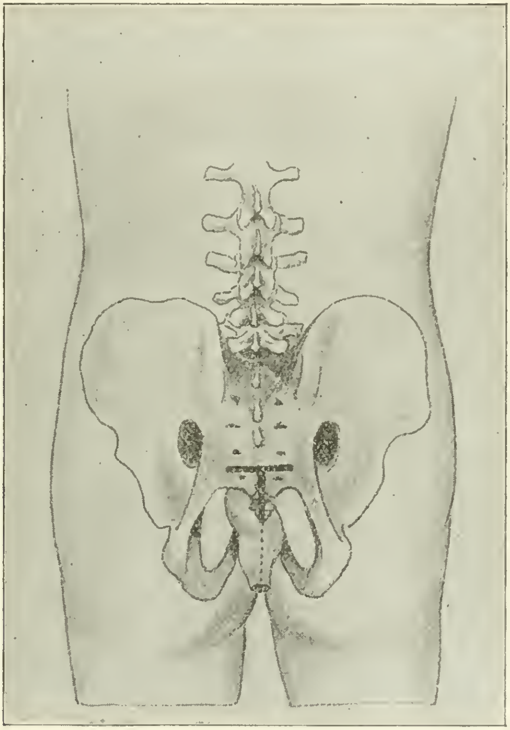

Fig. 15.—Sacral excision after Heinecke. This figure has been drawn from models by Professor His (Leipzig).

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[1] Archiv für klinische Chirurgie, 1891, p. 887.

I pass on, now, to temporary sacral resection. Heinecke was the first to advocate the preservation of the bony fragments.[1] He cuts the sacrum transversely below the fourth foramina and then makes a second section from the tip of the coccyx to meet the horizontal one. (Fig. 15). The bony flaps are retracted, the diseased segment of the intestine is removed, and the two healthy ends are sutured in front. In addition, he splits the lower end of the bowel in the middle line down to the anus. The bony flaps are replaced, and after some weeks he performs a plastic operation, establishing the continuity of the two ends and restoring the sphincter. The splitting of the lower end is done for the purpose of promoting union of the two segments and of allowing free exit for fæces.

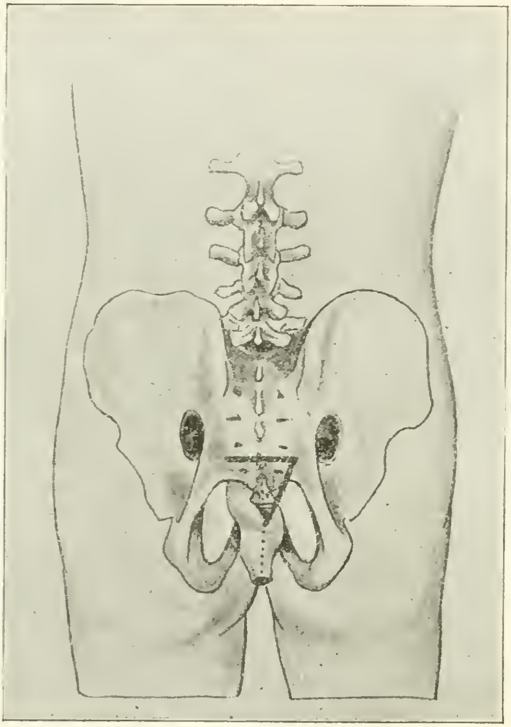

FIG. 16.—Sacral excision after Roux-Rehn.

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[1] Münchener medicinische Wochenschrift, 1888, No. 37.

Another method is that of Roux. (Fig. 16).[1] His incision has the shape of the figure 7. It begins in the middle line just behind the anus, and extending backwards it follows the right border of the sacrum to the level of the sacro-iliac articulation, separating the tissues from the bone. The horizontal limb is directed across the middle line below the third sacral foramina. The bony flap is turned towards the left side and held there by a temporary suture.

Almost identical operations are performed by Rehn and Rydygier. The latter draws attention to the fact that it may be possible to reach the rectum by the parasacral limb of the incision. Rehn makes his incision parallel to the left border of the sacrum, and makes the horizontal one below the third sacral foramina, or merely removes the coccyx. This method is highly spoken of by Heidenhain.[2] Hegar recommends a Y-shaped incision. The two limbs of the Y follow the sides of the sacrum and coccyx. The tissues are cut and retracted from the bones. A blunt dissector is passed beneath the sacrum, separating the rectum from it. The bone section is made with a chain-saw following an oblique line which commences on the right side between the third and fourth sacral foramina, and on the left side passes below the fourth. Although originally intended for sacral hysterectomy this method is advocated by some surgeons for rectal excision.

Many other methods for temporary sacral resection have been proposed and practised; those which I have alluded to, however, I consider the most important.

There certainly appear to be good reasons for adopting temporary sacral resection. Removal of the coccyx and part of the sacrum does away completely with the posterior support of the levatores ani. These muscles, together with the pelvic fascia and sacro-sciatic ligaments, become relaxed. The scar tissue which subsequently forms behind may help to serve as a point of support. However, as in some cases repair is preceded by suppuration, rapid atrophy of the muscles takes place, and the pelvic organs and the rectum especially are deprived of support.[3]

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[1] Morestin, loc. cit.

[2] Die medicinische Fortschritte, No. 2, 1896.

[3] Morestin, loc. cit.

For these reasons we should not totally discard temporary sacral resection. It would be an ideal method to restore the osteoligamentous portions of the pelvis. It is hard to sacrifice healthy parts simply as a preliminary procedure. Certain disadvantages must also be considered. In some of the methods the bony flaps are badly nourished and therefore liable to necrosis and non-union. Restoration of the bone may close the wound too completely, so that inflammation extending from the intestine and leading to suppuration will become diffused and may attack the bone and cause necrosis. Finally, it has been asserted that temporary resection does not afford sufficient room. This may be true for certain cases, but I think it is sufficient to allow the necessary manipulations for removal of the disease, especially when situated in the lower part of the rectum.

The following are brief notes on a case of temporary sacral resection kindly taken by my dresser, Mr. Foster.

Patient, L. M., female, aged forty-five years, was admitted into Sir Patrick Dun's Hospital on August 17, 1896, having been sent by Dr. Carroll, of Dromahair, County Leitrim. She stated that her symptoms date back for about ten months. She complained of a sense of fulness in the rectum and a constant desire to defecate. Some blood had appeared in the motions and she had been subject to constipation. On passing a finger into the rectum a hard, well-defined mass was felt involving almost its entire circumference. Its lower border corresponded apparently to the junction of sacrum and coccyx. The upper border was reached and healthy mucous membrane felt above it. The growth was movable and did not apparently exceed the limits of the intestinal wall. The patient appeared otherwise healthy, no other visceral disease could be detected. A diagnosis of cancer made; operation was advised and agreed to. The preparatory treatment was identical with that which I have already described.

Operation.—An incision was made from the middle of the sacrum forwards to a point about half an inch behind the anus. The sacrum and coccyx having been exposed, the incision was deepened behind the anus in the middle line, through the pelvic diaphragm and the posterior wall of the rectum exposed. With strong pruning-shears the coccyx and last sacral vertebra were cut in the middle line, and a second transverse bone section was made with an osteotome between the fourth and fifth sacral vertebræ. The two bony flaps and the levatores were well retracted and the rectum freely exposed. Below the growth it was set free and cut across between two pairs of forceps. Then by careful dissection it was liberated to a point well above the disease. In doing this the presacral tissue was freely incised, some lymphatic glands were removed, and bleeding vessels were tied. Having drawn down the bowel to the required extent, it was clamped well above the growth and cut across. The peritoneal cavity was not opened, but the peritoneum was displaced upwards. The healthy ends of the rectum were united by a Murphy's button (largest size). The sacral wound was partially closed ; one deep suture was passed near the upper angle and beneath the bone-flaps, which came together easily, another was inserted near the lower angle and included the levatores. The middle of the wound was left open and some iodoform gauze inserted.

The progress of the case afterwards was very satisfactory. The button was removed on the tenth day by gentle traction through the anus, and the bowels were made to act. Some fæces, however, came by the wound. The bowels were made to act daily with sulphate of soda, and the rectum afterwards irrigated.

NOTE.—On September 9 condition of patient much improved ; wound rapidly healing, and the fistula has nearly closed. There is perfect sphincteric action. October 10 fistula has closed ; the finger in the rectum can detect a ridge formed by the union of the two segments. The bowels act daily.

The third variety of sacral operation is, to reach the rectum by a parasacral incision. This mode of access I have already alluded to in the operation of Rehn. The parasacral method, however, has been more frequently employed for hysterectomy than for rectal excision. Zuckerkandl, the Viennese anatomist, advocates an incision which commences at the left posterior superior spine, extends along the left border of the sacrum and coccyx, and terminates midway between the anus and the tuber ischii. Mr. Clutton[1] speaks highly of this method ; he has employed it for disease affecting the rectum in its upper part.

I have already observed that the crucial point in sacral excision of the rectum is the uniting of the two ends after the cancer has been removed. Circular rectorrhaphy has nearly always failed, but better results have more recently been obtained by the use of Murphy's button or by decalcified bone-rings.[1] Unfortunately, however, even in cases where union has been obtained by these means, a certain degree of stricture is liable to occur subsequently where the two ends meet.

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[1] Lancet, February, 1895, p. 408.

There are some cases where such a method of treatment is less suitable, more especially for those cancers situated in the lower portion of the rectum. The lower end will not admit of a Murphy's button or bone-ring, and suturing may be difficult or impossible unless we adopt the device of Heinecke and split the lower end down to the anus and connect it in front only with the upper end. In these cases the method of Moulonguet (Amiens) answers admirably.[2] He removes the mucous membrane from the lower segment down to the anus, taking great care not to injure the external sphincter. When the cancer has been excised he draws down the upper end and sutures it to the sphincteric orifice. Moulonguet remarks that with this method there is less chance of abscess and fistula, since the intestine opens on to the exterior. The sphincter may be divided behind to facilitate the dissection of the mucous membrane, but it had better be left intact. If the growth is situated high up, this operation may be less suitable, for, in order to draw down the healthy part of the bowel, violent traction might be necessary, and the superior hæmorrhoidal vessels might be sacrificed, and the vitality of the rectum seriously interfered with. On the other hand, it is often surprising to observe how freely the intestine descends, and I think it is advisable to draw it down to the anus even when the cancer is rather highly placed, provided that it comes easily and that too great traction has not to be exercised. If the cancer is high up, I would certainly follow the advice of Heidenhain and open the peritoneum as soon as possible. Then, if the mesentery be cut at its root bit by bit, the gut may descend without traction to the anus. By cutting the mesentery of the pelvic colon in this way there is seldom any serious interference with the nutrition of the part set free.

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[1] Littlewood, Lancet, September, 1896, p. 745.

[2] Société de Médecine d'Amiens, July, 1890.

Before dividing the bowel, it is well to pack some sterilized gauze beneath it, and to make the section between two elastic ligatures. If it will neither descend to the anus as in the operation I have described, nor meet the distal sound portion, it must be secured in the sacral region, forming the anus sacralis of Hochenegg. At the same time it is well to twist the intestine in its long axis before suturing it to the skin so as to form a sort of sphincteric apparatus as advised by Gersuny.[1] This is better, apparently, than the method of Witzel,[2] who draws the intestine through a slit in the glutæus maximus.

The following are notes of a case for which I am indebted to my surgical dresser, Mr. Orr. They will serve, I think, to illustrate some of the points to which I have just alluded.

J. R., aged forty-seven years, was admitted into Sir Patrick Dun's Hospital, under my care, by Dr. Walter Smith, August 4, 1896. His symptoms date back for nine months. He has suffered from severe tenesmus. The fæces are passed like worms or as firm pellets mixed with blood and mucus. On rectal examination an ulcerated, hard, and warty growth can be felt, about three inches from the anal margin. It completely encircles the bowel and extends upwards for about two inches. With difficulty only can the finger be passed through the lumen. The growth apparently is movable and does not appear to have acquired adhesions to the parts around it. Rectal carcinoma diagnosed and operation advised. Preliminary treatment conducted as already described, including thorough irrigation of the rectum and curetting of the growth.

Operation.—Patient placed in the latero-prone (left) position, and an incision made from centre of sacrum to a point behind the anus, the coccyx was removed, and the sacrum divided as in the method of Bardenheuer. The levatores were separated in the middle line and retracted from the rectum. This was set free below the growth and cut across between two pairs of forceps. The diseased segment was dissected from below upwards, and in doing so the peritoneal cavity was freely opened, and the mesenteric cord behind was partially divided. The rectum came down quite easily; it was

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[1] Centralblatt für Chirurgie, 1893, No. 26.

[2] Ibid., 1894, No. 40.

clamped above the growth and cut across and a sponge placed beneath protected the peritoneum. This was now shut off, so far as was possible, by a continuous catgut suture, and the mucous membrane of the distal segment removed, after which the upper one was drawn down and sutured to the anal margin. Three deep sutures were passed behind, partially closing the sacral wound and including the levatores ani. The parts having been well flushed with creolin lotion, were dried and powdered with boracic acid, and a plug of gauze inserted into the open part of the wound. After-course uneventful, the patient was soon able to get about, and the wound steadily closed. On October 1 I made an examination and found the wound perfectly healed, and sphincteric action good. Patient had put on flesh and had gained considerably in strength.

Recently I have had the privilege of witnessing two somewhat similar cases of rectal excision in the practice of my colleague, Dr. Ball. In both cases the rectum was drawn down and sutured at the anal margin, and the results so far have certainly been very satisfactory.

M. Perron,[1] of Bordeaux, describes an ingenious device for connecting the healthy segments when the disease is situated low down. The lower or distal segment is turned inside out and drawn down gently through the already dilated anus, its mucous surface looking outwards and its cellular surface inwards. Into the sheath formed by the latter the proximal end is drawn, and by gentle traction is made to descend until its cut edge lies flush with the lower one. The sutures can now be applied with ease and rapidity somewhat in the same way as in Maunsell's method for enterorrhaphy. The parts are then restored inside the anus.

I have already mentioned that in cases where cancer is situated high up in the rectum, during the operation for its removal, an attempt might be made to draw the proximal end downwards and fix it at the anus following the method of Moulonguet, or it might be united with the distal segment or brought backwards so as to form a sacral anus. Cases, however, have been recorded where this could not be done in consequence of the difficulty in drawing down the bowel to the skin without interfering with its vitality. Having had such experience, M. Gaudier (Lille) proposes an operation, which he terms "perineo-abdominal."[1] It is briefly as follows: He begins with a laparotomy, Trendelenburg position. The rectum is sought for and the limits of the disease felt. The iliac colon is drawn out and cut across between two elastic ligatures, and a piece of iodoform gauze is placed over each cut surface. The mesentery of the pelvic colon is tied and cut, and the peritoneum in front of the rectum is also cut, and the latter is separated by the index-finger. By the perineal method the lower part of the rectum is dissected up to the part already set free. The entire mass is then removed by the anus. The upper end is fixed to the abdominal wall and the perineal wound is closed.

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[1] Gazette hebdomadaire des Sciences médicales de Bordeaux, 1890.

Gaudier claims the following advantages for his operation: (1) Complete extirpation of the cancer; (2) Removal of the lymphatic glands; (3) the possibility of complete asepsis; (4) there is not the bony mutilation of Kraske; (5) the artificial anus in the inguinal region is more supportable and is more easily supervised than one in the sacral region.

Quénu modifies this operation. He would begin by Heinecke's sacral resection and remove the cancerous portion, as one cannot tell beforehand how far the bowel will descend. If, then, it were impossible or inadvisable to bring it down so as to form a sacral anus or to unite the two ends, he would attempt the formation of an artificial anus in the inguinal region, removing the rectum with part of the colon, closing the sacral wound and draining the presacral space. He calls his operation "sacro-abdominal."

Professor Châlot,[2] of Toulouse, advocates also the perineo-abdominal operation, and in performing it he begins by ligaturing the superior hæmorrhoidal artery, so as to prevent loss of blood. The remainder of the operation is like that of M. Gaudier.

In conclusion, let me summarize the more important points relating to the radical treatment of rectal cancer.

(1) Great care should be exercised in the selection of cases

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[1] Bulletins et Memoires de la Société de Chirurgie, Paris, Tome XXII, p. 271.

[2] Bulletins et Memoires de la Société de Chirurgie, Tome XXII, p. 310.

for operation. Cancers which have exceeded the limits of the bowel and have acquired adhesions to neighboring parts had better be left alone.

(2) The preparatory treatment deserves our utmost attention, having as its object the improvement of the patient's general condition, and as great a degree of intestinal asepsis as it is possible to obtain.

(3) Free purgation, intestinal antiseptics, and rectal irrigation cannot have a really useful effect so long as there exists an ulcerating cancerous surface swarming with virulent micro-organisms. The use of the curette, whenever possible, followed by irrigation, should accompany the other measures.

(4) A preliminary colotomy can scarcely be recommended as a matter of routine. It appears to be chiefly indicated when attempts to empty the intestine and cleanse it have either been impossible or attended with difficulty.

(5) We should consider a certain number of types of rectal cancer, both as regards their site and extent, with a view to determine the methods best suited for their removal.

(6) Three cardinal rules I would suggest as applicable to all cases: (1) Control bleeding as much as possible. (2) Let the principles of aseptic surgery be as strictly observed as the field of operation will admit. (3) Avoid rough manipulations in the separation of the disease; let it be effected for the most part by a process of careful dissection.

(7) The perineal operation is best employed for ano-rectal cancers,—that is, for cancers which involve the sphincteric zone and extend for some distance above it.

(8) If possible, the rectum should not be split in its removal nor should the finger be introduced to serve as a guide in its separation. Elastic ligatures should be applied and sterilized gauze placed beneath before it is cut.

(9) Cancers situated in the suprasphincteric region had better be removed by the sacral method. As contrasted with the perineal, it gives more room, bleeding is more easily controlled, separation of the disease is more readily effected, and it gives the best functional results.

(10) Temporary sacral resection should not be entirely dis-

regarded, owing to its manifest advantages over the more extensive mutilation of Kraske and Bardenheuer.

(11) If, when the cancer is excised, it is found that the upper healthy segment descends easily, it is worth making an attempt to suture it to the anal margin, having previously removed the mucous membrane from the lower segment.

(12) In cases where the ends of the bowel have been united after removal of the cancerous segment, it is well not to close the sacral wound completely, for fear of accidents.

(13) For cancers situated high up, as well as for those of wide extent in the rectum, the formation of a sacral anus is often the only means at our disposal.

(14) In such cases it appears advisable to follow the advice of Gersuny, and give the bowel a twist on its long axis before attaching it to the skin, the object being to establish a modified sphincteric apparatus.

(15) The perineo-abdominal and sacro-abdominal operations are grave; they involve serious risks, and can only be required in very exceptional cases. However, we must encourage attempts which help to extend more widely the indications for complete removal of the disease and such as are suitable for those desperate cases in which the palliative treatment afforded by an artificial anus has hitherto been our only resource.

THE EFFECT OF HIGH ALTITUDES IN AGGRAVATING SURGICAL SHOCK.

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SURGICAL shock is usually of mixed origin, but the trend of the best opinion is now towards the belief that hæmorrhage and lowered blood-pressure are the chief factors in its production ; that the blood need not of necessity be wholly lost outside of the vessels, but that it may be as truly removed from the general circulation by being retained in the enormous venous channels of the viscera through splanchnic and vasomotor inhibition, or paralysis, as if it were taken entirely outside of the body ; we must therefore regard surgical shock as directly due to the reduction of the volume of blood *in actual circulation*, and treat the subject from that stand-point.

This view is in accordance with the theory of Fischer and Goltz, and seems proved by Goltz's experiment, in which he arrested circulation by tapping the belly of the frog. According to Fischer, the great mass of the blood stagnates in the abdominal veins and arteries during shock, and this, he thinks, is a sufficient physiological explanation of the symptoms.[1] Whether we accept this theory of Fischer's or that of Groeningen (the spinal cord origin of shock) is immaterial, as the effect upon the circulation is the same.

It seems probable, when we remember the symptoms of hæmorrhage, that nature endeavors, through some reflex influence, to save all the blood possible by enfeebling the heart's action, dilating the venous canals, etc., as the governor of a steam-engine controls the supply of steam to the cylinders.

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[1] Warren's Surgical Pathology and Therapeutics, p. 279.

The consideration of the subject from this stand-point belongs to the domain of experimental physiology, and, with the question of the relative force of the blood-pressure at sea level and at high altitudes, must be left to the physiologist for final settlement; we, as surgeons, cannot hope to go much farther than to the practical consideration of the matter as we meet it in our daily work.

In this connection it may be well to note that cardiac stimulants, transfusion, and infusion are distinctly contraindicated while hæmorrhage is going on, as they directly oppose the conservative efforts of the natural processes, and that if we accept this view of the *conservative agency of shock*, we must, to be consistent, advocate immediate operation for the arrest of hæmorrhage without waiting for the so-called reaction. Empirically this certainly seems to be the better plan.

Some surgeons think that hæmorrhage is more free and copious at high than at lower altitudes; that oozing is more persistent and troublesome, and that these may be the cause of more pronounced surgical shock. The observations I have made would not incline me to a confirmation of this opinion; on the other hand, I should say that bleeding was less copious and troublesome at an altitude of one mile than I have been accustomed to observe at sea level, but that *the effect of bleeding is much greater*, and the shock from the hæmorrhage more rapid in its onset, and more pronounced in its severity.

The difference between the atmospheric pressure at Denver, for example, and at the sea level is a little more than three pounds to the square inch,—that is, instead of being about fifteen pounds, it is only eleven and six-tenths; this difference is great enough to change the boiling-point of water from 212° F. to about 202° of the same scale, and is appreciable to most newcomers in the respiratory changes which it causes.

Our knowledge of mechanics and hydraulics teaches that this alteration in atmospheric pressure must of necessity alter the blood-pressure, and affect the circulation of this fluid in the vessels, but to what extent these changes take place, and to what extent the conditions are counteracted by compensatory alterations in the muscular and the vasomotor systems, have never been definitely determined, nor can we expect them to be determined soon on account of the great difficulty in properly estimating the various phases of this intricate problem.

But besides the questions just referred to, we must consider the changes in blood-pressure and in circulation under other conditions, such as decrease in the volume of blood in the vessels, and the decrease of volume in actual circulation after hæmorrhage, and whether in these circumstances the reduced atmospheric pressure may play an important part in causing the venous stasis, and so serve to make shock more profoundly manifest.

Much of the force with which the blood circulates is directly due to the elasticity and contractility of the vessels themselves, to the support and pressure of the tissues about them, and, from without, to the direct, or transmitted, but constant sustaining force of the atmosphere. The heart's impulse is but one of the forces in producing blood-pressure, and it has been demonstrated that in certain animals this impulse is not indispensable to the circulation, which may go on for some time after the removal of the heart if the gap in the vascular canals is filled.

The effect of intra-abdominal and of intrathoracic pressure upon the blood-vessels, and their influence upon the pressure and upon the volume of blood contained in the vessels, are well exemplified by the engorged state of the vessels of the head and face during straining muscular efforts, as in lifting or at stool. The frequent occurrence of cerebral hæmorrhage under the last-mentioned condition is another illustration of the same thing. This state of congestion is directly produced by the muscular compression of the visceral blood-vessels, with consequent reduction of their calibre and capacity, and the squeezing of their blood into vessels not thus compressed, which then become proportionately distended.

Atmospheric pressure acts in precisely the same way, except that the distribution of the force is over a greater surface, and the variations in pressure are ordinarily much more gradual.

"Persons exposed for a considerable time to a greatly increased atmospheric pressure are liable, after the pressure is removed, to certain morbid effects which comprise what is known as the caisson disease. It is observed principally in those employed in submarine operations by the use of compressed air, and who labor for hours together in what is termed by engineers a caisson. The pressure varies with the depth at which the work is carried on, and reaches sometimes fifty or more pounds to the square inch. The disease rarely if ever occurs when the pressure is less than fifteen pounds, and its severity is, other things being equal, in direct ratio to the increase in the density of the atmosphere.

"In the writer's view the explanation is to be found in the changed condition of the circulation, which results first from the increased pressure on the surface, and then from the sudden removal of the pressure. While the subject is in the caisson the blood is driven from the peripheral vessels towards the interior of the body, where the pressure is less than at the surface. It is also forced from the more compressible tissues into the solid and resisting organs, such as the liver and kidneys; and, lastly, it flows towards bony cavities, for the reason that their walls resist the effect of direct pressure, and equilibrium of pressure can be restored in them only by an afflux of blood. Thus the distribution of the blood is everywhere changed, and the size of the vessels is no longer determined by the muscular action of their walls, but by the amount of blood forced into them, the vital action which should regulate the circulation being entirely overpowered and set at naught by an overwhelming physical force operating from without. The vessels become merely passive tubes, distended in some places where they are protected from pressure, and compressed in others where the tissues about them are compressible. By this transfer of blood from one part to another the equilibrium of pressure is restored and the circulation goes on, though without any regard to the physiological demands of the different organs. There is no stasis anywhere so long as pressure and counter-pressure are equal, thus allowing fair play for the action of the heart.

"If now the external pressure is removed, what is the result? Vessels which have been compressed and almost emptied of blood will now offer new channels through which the blood can rush, and vessels overcrowded with blood, with their walls paralyzed by over-distention, will have the current in them slowed almost or quite to the point of stopping."[1]

To some degree, and I believe it to be much greater than we have heretofore understood, these same circulatory changes take place with such variations in altitude and atmospheric pressure as are incident to travel and residence on this continent. From the sea-level to Tennessee Pass (just west of Leadville, on the Denver and Rio Grande Railroad) there is a difference of more than two miles in altitude.

That these forces are operative to a decided and material degree when the blood-pressure and volume have been reduced through hæmorrhage is certainly true, particularly in unacclimated persons.

The influence of mechanical pressure upon the splanchnic vessels is shown by the symptoms which follow the tapping of large abdominal cysts. "Cases of sudden death often follow the tapping of cysts, particularly in the abdominal cavity. Many of these cases should be regarded as local hyperæmias due to the sudden removal of pressure from the abdominal blood-vessels."[2]

Given a case, then, in which the volume of blood is reduced by hæmorrhage, the blood-pressure suddenly lowered from its normal point, whatever that may be, the vasomotor nerves inhibited so that as much blood as possible may be saved to the patient by being stored up in the viscera and the venous canals, will the gain or loss of more than three pounds of atmospheric pressure to the square inch on the outside of the blood-vessels alter the conditions in either direction, and, if so, how? Will the opening of the abdominal cavity in such a case make a difference through the admission of air and the loss of muscular and mechanical support to the vessels of the viscera? With the abdomen open and the unsupported splanchnic veins exposed directly to atmospheric pressure, does it make any difference whether that support is given at a rate of fifteen pounds to the square inch or at only eleven and six-tenths pounds? Will not the venous stasis and the loss of blood to the active circulation be greater with the lighter atmospheric pressure? and may we not expect to find under these conditions the symptoms of shock more pronounced, and may we not infer that hæmorrhage at high altitudes will not be so well borne as at sea-level?

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[1] The Caisson Disease, by Andrew H. Smith, M.D., Pepper's System of Medicine, Vol. III, pp. 854 and 856.

[2] Surgical Pathology and Therapeutics, Warren, p. 291.

One would expect to find the actual experience of those who operate under these conditions in accord with this hypothesis; but be that as it may, I satisfy myself for the present with a statement of the subject as I now view it, and ask those who have the opportunity to observe and record for future use such facts as bear on the subject.

My experience with surgical shock at Denver, which is just a mile above the sea, is directly in line with the foregoing theory, and would tend, as far as is possible with a limited experience, to confirm the main features in my solution of the problem. In major operations unaccompanied by much loss of blood no shock was noted, though two were hysterectomies for large fibroid tumors of the uterus; while two patients, for whom I did hysterectomy for cancer, and who came to the hospital anæmic and exsanguinated, after many months of exhausting hæmorrhage, amazed me by presenting such symptoms of shock after operation as I was entirely unprepared for, and feel sure could not have taken place under precisely similar conditions at sea level. At any rate, in the whole of my surgical experience in the East, I have never seen anything like it under similar conditions. Neither of these patients had profuse hæmorrhage after nor at the time of operation, but were anæmic and bloodless, and the subjects of lowered blood-pressure when they came under observation. In one of these cases I acted upon the foregoing theory, and had the intense satisfaction of seeing her rally with surprising rapidity, and ultimately make a complete recovery. The history of the case is this.

Mrs. X., of the State of Washington, aged forty-four years; tertipara; last labor fourteen years ago; menstruation always regular till six months ago, when she began to bleed from the vagina more or less constantly and more and more freely as time elapsed. After being about town and on her feet more than was usual for her, she had, towards the last of October (1896), a severe flooding, which made it necessary to hasten home and to send for her physician, who up to this time had not been permitted to make such an examination as he deemed necessary for a positive diagnosis. At the request of the attending physician I saw the patient, and at once diagnosed cancer of the cervix, which was rapidly invading the adjoining tissues, and advised prompt operative interference. Upon this advice she was taken to St. Luke's Hospital, in Denver, and prepared for operation, which was performed at 12 M. on Thursday, November 5. When admitted to the hospital she had a thin, feeble pulse of about 80 beats per minute, which would sometimes be altogether lost for a moment or two.

The uterus was not mobile, the broad ligaments were rigid, and it was a question whether this was due to invasion by the morbid process or to an old pelvic inflammation of which she gave a history. The operation was therefore undertaken with the distinct understanding that it would of necessity be a grave one to a patient in her feeble condition, and that it must be a high amputation of the cervix or a total hysterectomy, as should seem best as the operation proceeded. The dissection was difficult and somewhat tedious, as there was little margin outside the diseased area for the separation of the bladder or for the making of the right vaginal flap; but it was at last found possible to perform a complete and quite satisfactory hysterectomy, by which all the diseased tissues were removed. The operation lasted about one hour, and was almost bloodless. The patient was put to bed with a good pulse, due doubtless to the ether stimulation, but with a subnormal temperature of 97.6° F.

After four o'clock that afternoon, November 5, her temperature steadily declined, being 96.6° F. at six o'clock, and only 96° F. at 7 P.M. The respirations became rapid, and the pulse had entirely disappeared at the wrist. There had not been sufficient evidence of a concealed hæmorrhage to warrant the supposition that these symptoms were due to that cause, the gauze drain through the vagina had been stained, but this was thought to be no more than was to be expected under the circumstances, and the case was treated as one of shock, pure and simple, in an exhausted and exsanguinated patient. One-fifteenth of a grain of strychnine was given hypodermically at short intervals, normal salt solution was thrown under the breasts to the extent of about a pint and a half, brandy and coffee by the rectum, and inhalations of oxygen were all tried, with the effect of bringing back the pulse at intervals, and of restoring the temperature to 97° F., but the skin remained cold and clammy, the pupils were dilated, and the result could not be doubted unless some more profound reaction should be brought about. It was then considered best to act upon the supposition that some concealed hæmorrhage was taking place, although positive evidence was still wanting. With the consent, assistance, and loyal support of the attending physician, Dr. S. G. Bonney, she was again taken to the operating room, a rapid laparotomy was done, a small bleeding point found and tied in the top of the right broad ligament (it having retracted out of the grasp of the clamp, after the parts had been divided) and a small clot removed, representing the amount of blood lost, which was estimated at three, or at most, four ounces. As she was in the Trendelenburg posture the abdominal cavity was then flooded with salt solution at a high temperature (estimated 110° F.), not with any idea of irrigation, for it was not allowed to flow out, but for the purpose of procuring the *full effect of the heat*, with the mechanical support of the large volume of water, and this ultimate absorption into the partially evacuated blood-vessels. Nearly a gallon of the salt solution was thus introduced and *retained* in the upper abdominal cavity, in contact with the liver and the great abdominal veins, as well as with the veins of the viscera. The patient was then put into a hot bed with the foot well raised, little or none of the water being lost through the vagina, which had been again tightly tamponned. The work was done with great rapidity, the patient being out of her bed less than twenty minutes.

This operation was performed at 11.30 P.M., twelve hours after the first one. Her reaction was prompt and permanent. In less than thirty minutes she had a normal temperature and a good, full, regular pulse, which was much better than she had ever had since she had been under my observation. She went on steadily, and without any untoward event, to complete convalescence, leaving the hospital three weeks from the day of the operation.

The amount of blood lost at and after the operation was inadequate to produce these results, if the patient had had a normal volume of blood to begin with; but it was the "last straw," and while she did not present all the symptoms of concealed hæmorrhage, there was enough leakage from the vessels to start nature's conservative mechanism into action, and it only needed the arrest of the oozing and the stimulation of the heat, pressure, and added volume in the blood-vessels to set all the functions once more into active and normal operation.

As I have said, I was entirely unprepared for this degree of shock in this case, and believe it to have been much greater than the same patient, under the same conditions, would have had at the sea level. The amount of blood lost was not more than I had often seen lost by patients under the same conditions of primary depletion, and during and after such operations. What was responsible for the great difference in the course and conduct of this case?

Careful and deliberate consideration of the whole subject has led me to the following conclusions:

In regard to shock in general at any place, that acute peripheral anæmia is the earliest and most marked symptom, and that this is due to the lowered blood-pressure, and to the retention of the greater volume of the blood in the dilated visceral blood-canals; that this is true whether hæmorrhage has taken place or not, but is, as a matter of course, much more pronounced and permanent if the volume of blood in the vessels has been materially and permanently reduced through hæmorrhage.

That bleeding into these visceral blood-channels may for a time produce alarming symptoms; but if the normal volume of the blood has not been reduced by hæmorrhage, and the normal tension in the blood-vessels is not thus prevented from being re-established, the reaction may be rapid and complete.

That actual loss of blood from the blood-vessels through hæmorrhage (on the surface or concealed) is the common cause of pronounced and prolonged shock, and that gradually "increasing shock,"[1] is almost always due to this, and is apt to be such because the hæmorrhage is still going on.

That the blood-pressure is speedily reduced, and its circulation hindered in a rapidly-increasing ratio as the volume of blood is made smaller, because the tension and the support given to the circulation by the blood-vessels is lost with great rapidity as they become more and more empty.

That the elasticity, muscular contraction, and the forces from without the blood-vessels have much to do with the circulation and pressure of the blood, and that upon the relative strength of these forces and upon the volume of blood on which they have to act, largely depend the pulse-rate and force, as well as the symptoms and phenomena of surgical or of other shock.

In considering altitude and atmospheric pressure and the part they play in altering all or any of the conditions with which we have to do, it is necessary to begin with certain fundamental facts. I have, therefore, formulated the following axiom: *The calibre and capacity of an elastic and contractile aqueduct will depend on the power of its contractions, and upon the relative force of the pressure from without and from within.*

Such a vessel may be made to hold more fluid if its contractility be diminished, if the pressure of its contained fluid be increased, *or if the pressure and support which have been exerted upon its outer wall are diminished.*

In shock at high altitudes two of these things occur; the contractility of the blood-vessels is diminished, as is also the pressure on the outside wall, and where these are associated with reduction in the volume of the blood, through hæmorrhage, the size of the blood-vessel is enormously increased, *in proportion to the smaller volume of blood*, and the blood-pressure and circulation soon reach the vanishing point. It must be evident to all that the gain or loss of more than three pounds of atmospheric pressure to every square inch, on the entire surface of the body, including that of the respiratory tract, is in the aggregate a tremendous force and must be reckoned with.

[1] W. G. MacDonald, American Journal of Obstetrics, Vol. XXXIV, No. 227, p. 643.

Hæmorrhage, and reduced blood-volume under these conditions, must be of serious significance, and it is only fair to infer that great reduction of the volume of the blood at high altitudes is more serious in its consequences than at sea level.

"The physiological effects of high altitude on man are well understood when we consider the decreased pressure of the air which obtains at a given elevation. Reckoning the superficial area of a man's body as sixteen square feet, and the pressure to the square inch as three pounds less at the base of the Rocky Mountains (6000 feet) than at sea-level, we have this surface relieved of the enormous weight of nearly 7000 pounds." "But when we go further and learn that Lieberkühn has computed the area of respiratory surface in both lungs of man to be 1400 square feet, which Dalton avers is not exaggerated, we find a subtraction of pressure from these organs which is truly wonderful, even for an elevation of one mile."[1]

A computation of the loss of pressure from without, direct or transmitted, which the blood-vessels suffer at this elevation, would furnish astonishing figures, and it seems certain that this great change in blood-pressure has been too little considered in this connection; also that its full value has been overlooked to some extent in the consideration of those pathological conditions for the cure of which high altitudes are often prescribed; the respiratory phenomena being chiefly studied though they are but the *effects* of circulatory changes, and not so much due to rarefied air and reduced supply of oxygen for breathing purposes as has hitherto been taught.[2]

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[1] Rocky Mountain Health Resorts, by Charles Denison, M.D., Denver, p. 81.

[2] "But quite apart from gross effects of this kind, it is very obvious that the organism must in many ways suffer from a diminution of pressure. The complex and delicately-balanced vascular system is constructed to work at the ordinary atmospheric pressure. The force of the heart-beat and the tonic contraction of the small arteries are, so to speak, pitched to meet the influence exerted on the outside of the blood-vessels by the ordinary pressure of the atmosphere; and any great diminution of that pressure must produce a greater or less disarrangement of the vascular mechanism until it is counterbalanced by some compensating changes. And a little reflection will supply many other instances.

"We have already called attention to the fact that the total pressure of the atmosphere remaining the same the partial pressure of the oxygen in the inspired air

In making practical application of these ideas, a number of evident rules would occur to us. They are:

(1) In surgical operations, or in surgical shock everywhere, save for the patient every possible drop of blood.

(2) The importance of this precaution increases greatly as higher elevations are reached, and the atmospheric pressure is decreased.

(3) Anæmic and exsanguinated patients are more subject to surgical shock at high altitudes than at sea-level, and must be more carefully prepared for operation; extra precautions for the prevention of shock must be used at and after the operation.[1]

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may be reduced as low as about seventy-six millimetres, without seriously modifying the respiration. In order to attain the diminution of the partial pressure of the oxygen without changing the composition of the atmosphere, the total pressure of the atmosphere must be reduced to the limit of 300 millimetres, corresponding to an altitude of 17,000 feet. Now it is a matter of common experience that in ascending a mountain distress is felt long before such an altitude is reached. *The distress on such occasions is probably due not so much, if indeed at all directly, to the diminution of oxygen as to a general disarrangement of the organism, and perhaps more particularly of the vascular system. The nose-bleeding, which so frequently occurs under the circumstances, shows that the minute blood-vessels more directly exposed to the diminution of pressure are profoundly affected by it; and what is true of them is, probably, in various ways and to different degrees true of the whole vascular system.* [Italics mine, H. G. W.] The breathlessness which is so marked a feature on these occasions seems due not so much to the fact that the blood which reaches the respiratory nervous centres is deficient in oxygen, as to the fact that the troubled vascular system fails to deliver to these centres their blood in an adequate fashion."—A Text-Book of Physiology, by M. Foster, M.A., M.D., LL.D., F.R.S., p. 610–611, Part II.

[1] ". . . Hence, when the organism ceases to be able to meet the demands which the labor is making upon it, the subject is said to be 'out of breath,' though in a large number of cases the failure lies much more at the door of the vascular than of the respiratory system. And, as a rule, it may be said that when two men differ in their capacity for strenuous work, such as running a race, the difference, though it is often spoken of as one of 'wind' or power of breathing, is in reality not a difference in ventilating capacity, but a difference in the power of the heart to keep up to and work in harmony with the increased respiratory movements.

"Thus, there are two main factors in respiration, the respiratory mechanism proper and the circulation, the one bringing the air to the blood and the other the blood to the air. We may remind the reader that there is also a third factor, and that one of great moment, the amount of hæmoglobin,—that is, the number of red corpuscles in the blood. The amount of oxygen taken up from the lungs depends not only on the strokes of the respiratory and the vascular pumps, but also in the richness of the blood in red corpuscles. A body which from loss of blood or from

(4) "Increasing shock" after injuries or operations must be construed as strong presumptive evidence of continuing hæmorrhage. It must be made clear that there is no hæmorrhage before the ordinary remedies (cardiac stimulants, transfusion, etc.) are employed. *The reflex effect of oozing is to continue shock, which must be regarded as conservative in its tendencies while bleeding is still going on.*

(5) In treating shock after surgical operations or injuries, the first and most important thing is to arrest completely all farther loss of blood.

(6) By some means supply to the depleted vessels an increased volume of fluid at a *high temperature* for the heart and *blood-vessels* to contract upon, so that the circulation and blood-pressure may be speedily re-established. In abdominal operations this may be done by leaving a large volume of hot salt solution in the cavity; or, as in my case, the abdomen may afterwards be opened and the fluid introduced, thus securing at once the application of heat to the great abdominal nerve-centres, the mechanical pressure and support of a large volume of fluid as an object upon which the abdominal walls may contract, and thereby restoring to a degree the intra-abdominal pressure, as well as supplying water for absorption into the circulation. The sustained Trendelenburg position is, for obvious reasons, an important accessory.

(7) Diffusible and cardiac stimulants, with heat to the surface, and all other means for the re-establishment of the circulation in its full force and volume may now be freely employed.

(8) Natives, and thoroughly acclimated persons, are not so susceptible to the greater surgical shock in the higher altitudes as others; long residence and the gradual compensatory changes in blood-pressure, in vaso-motor action, and in muscular

disease is anæmic is thrown out of breath by very slight exertion, not so much because the respiratory or the vascular pump is weak, but because, through lack of oxygen-carriers, with their best efforts the combined pumps can only deliver to the tissues, including the medulla, an inadequate supply of oxygen. And fat persons, whose store of hæmoglobin in proportion to their body weight is always below par, are proverbially 'scant of breath.'"—A Text-Book of Physiology, by M. Foster, M.D., pp. 628 and 629, Part II. Fifth edition.

support of the blood-vessels, having adapted them in great measure to the lighter atmospheric pressure and to the conditions incident to it.

(9) Surgical operations upon unacclimated persons from lower altitudes, and those which involve much loss of blood, are fraught with more risk from shock as the altitude is increased, and extra precautions for its prevention are imperative with such patients. This being borne in mind, and proper precautions observed in the preparation of patients at the time of and after operation, as good results may be expected in high as in lower sections.

(10) In surgical shock at high altitudes use every means for the prevention of shock through the nervous system and the resultant blood stasis,—*i.e.*, preserve surface heat, save time in operating, avoid exposure and unnecessary handling of the viscera, etc.

Evaporation and heat radiation go on much more rapidly at high altitudes, and must, therefore, be especially guarded against.

To keep an almost nude patient on a cold, glass table for an hour or more, enveloped in wet, bichloride towels, and subjected to a "sloppy operation" is unwise anywhere, and not demanded by the tenets of modern aseptic surgery; in high altitudes it is little short of criminal to do this in face of the known facts, for with the rapid evaporation of the moisture, the increased heat radiation, and the loss of atmospheric pressure, it is not surprising that surgical shock should be great. Absolute antisepsis is not the only essential to surgical success, and all else is not to be sacrificed in securing it. Entirely too much importance has been attached to it, to the exclusion of other things which are of equal or even of greater importance.

NOTE.—This paper must be considered in the spirit in which it is offered,—*i.e.*, the whole theory of the effect of the reduced atmospheric pressure of moderate altitudes in reducing the blood-pressure in certain unacclimated and anæmic persons is as yet theoretical and speculative, and must be so regarded till it has been amply proved or disproved.

H. G. W.

THE OPERATIVE TREATMENT OF HALLUX VALGUS.[1]

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THE usual method of restoring the great toe to its proper position when it has been brought to the displacement known as hallux valgus is by a resection of the metatarso-phalangeal joint; either of both the joint ends or more commonly by the removal of the head of the metatarsal bone alone. A considerable experience in both the total and the partial resection has shown me, and particularly in the latter operation, that a fairly good result is thus to be obtained, but that this outcome will only take place with a considerable sacrifice of the metatarsal bone, and hence with marked shortening of the toe. This, it is true, does not materially interfere with subsequent locomotion, and even after such partial resection a considerable amount of motion may be retained. But the difficulty of overcoming the tilting outward of the toe was always great, and it is only of late years that I have been able to overcome this by sundry efforts, some self-inspired and some copied from others. To these I now propose to ask attention.

It may, however, be here stated in passing that the suggestion of remedying the deformity by an osteotomy at the neck of the metacarpal bone has been tried faithfully, and that it has failed with me to give satisfactory results. It is a method, I judge, only suitable to very mild deviations of the toe.

Frequent operations will not only show one the ordinarily detailed lesions, such as a partial luxation outward of the first phalanx with the head of the metatarsal bone thickened on its inner or exposed surface by bony or periosteal masses, and also the more or less inflamed bursa with its thin skin (to which strictly belongs the name of bunion), but the surgeon will also soon appreciate sundry other conditions that are brought about by the long duration of a faulty position or of a faulty nutrition. Thickening of the outer portion of the joint capsule with its associated ligament must, in my judgment, in every case receive marked attention; indeed, unless this restraint is fully overcome by free section, the toe cannot satisfactorily be retained in place. Even after cutting away the end of the metatarsal bone, in many cases the tilting outward of the toe will persist until all resisting fibres have been divided, even to the detachment of the adductor hallucis. The altered position of the sesamoid bones of the short flexor muscle will also attract attention, for one or both will be found outside the phalanx line between the heads of the first and second metatarsal bones. Maydl supposed this displacement might explain the deformity of a hallux valgus, and he advised and practised their removal alone for the relief of this trouble, but the deformity was found to recur as soon as the use of a shoe was resumed. Their removal, however, enables the distorted tendons of the long and short flexors to resume their normal action, nor has their absence occasioned in any of my cases any discomfort by taking away their "buffer" function, save in one instance, and then it was not of long duration. It was from Maydl, however, that I derived the hint to remove them. As an additional factor in keeping up or rather aggravating the deviation of the toe, the influence must be considered of the tendons of the extensor proprius hallucis on the dorsum of the toe, and of the tendons of the flexor longus and brevis hallucis on the plantar aspect. If once, by the pressure of a badly-fitting shoe the toe be decidedly inclined outward, these tendons then will pull more and more to the outside of the true axis of the toe, and it was from this stand-point that I was led, in October, 1894, in ignorance of Ullmann's[1] views, to cut away the tendon of the extensor proprius muscle, and to attach it, at the completion of the operation to the fibrous tissues on the median side of the first phalanx of the great toe. A later perusal of Ullmann's article, which was published in December, 1894, showed that he attached more importance to the action of the more powerful and displaced tendons of the long and short flexors. Ullmann not only recommended the detachment or division of the long flexor tendon, but that it should be carried to the median side of the phalanx and there attached to the tendon of the long extensor, which latter would thus also be carried again more nearly to its correct position. As I was aiming, if possible, at the retention of some motion in the partially resected joint, I felt that any impairment of the function of the flexor tendon was to be avoided, as its action, as is well known, is to keep up the spring of the foot in the last act in walking, by crowding the end of the great toe strongly to the ground. I have therefore practised Ullmann's method but twice, but with good effect, though time enough has not yet elapsed to speak of it as a superior method. It has, however, been resorted to in a modified way by Delbet,[1] who presented to the Société de Chirurgie of Paris, in their March meeting in 1896, a case of hallux valgus treated by chiselling away the hypertrophied bone projection, and then drawing back to its normal position the displaced flexor tendon, and, finally, as this overcame the toe deformity, fixing this tendon by suturing it to an artificial fibrous sheath taken from the tissues on the inner side of the metatarsal bone. As thus used, the general impression of the discussion was against the value of the tendon replacement. Of all these procedures, the complete liberation of the phalanx on its outer side by a free section of the binding capsule and other tissues is the most important, and next, if possible, that some portion of the metatarsal joint end should be saved, and especially at its plantar portion, in view not only of the possibility of future motion, but of the future support of the body. The removal of the aberrant sesamoids and reimplantation of the tendons (and principally the extensor) are secondary

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[1] Read before the New York Surgical Society, January 13, 1897.

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[1] Emerich Ullmann, Wiener medicinische Wochenschrift, December, 1894, No. 49.

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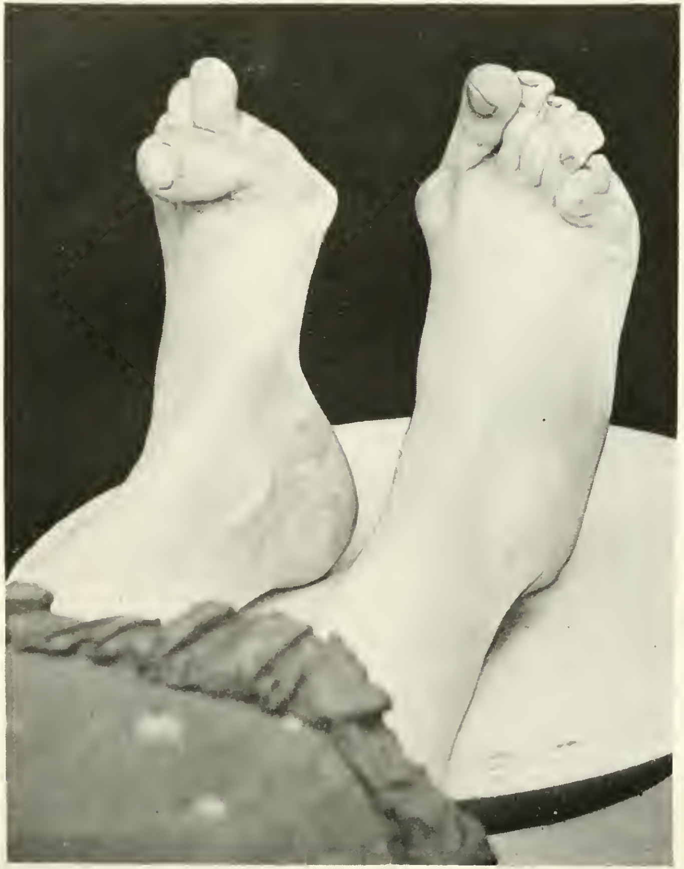
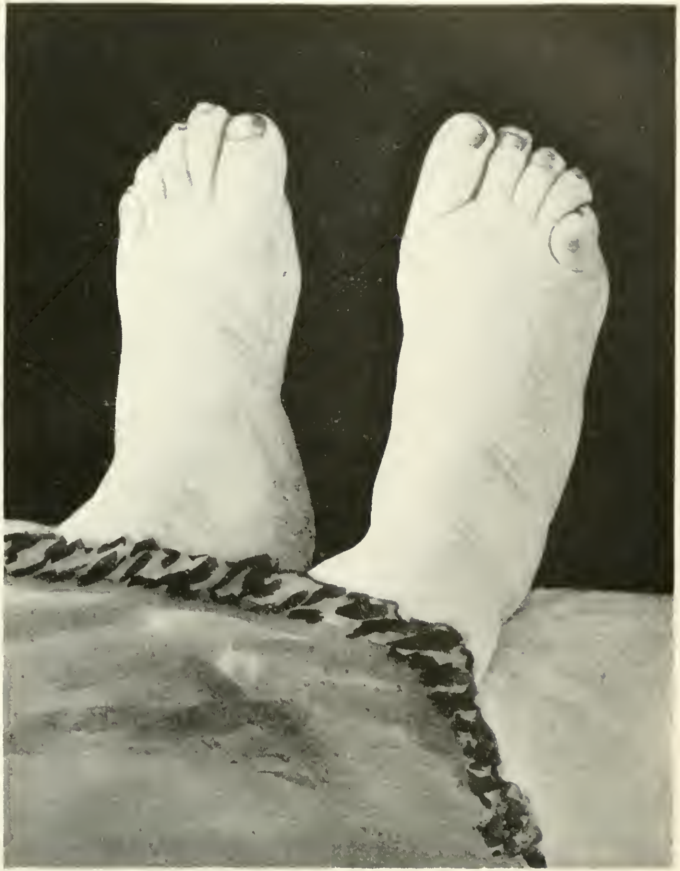
[1] Revue de Chirurgie, April, 1896, p. 329.



Case II.—Before operation.



Case II.—Showing the shortening of the toes from resecting the head details, and which, I believe, so far to have been serviceable in the cases narrated in this paper. They are as follows:

Case I.—C. B., male, aged twenty-two years, had been troubled for nine years with pain in the metatarso-phalangeal joint of the right great toe. There was the well-marked deformity of the hallux valgus, but no signs of acute inflammation. June 2, 1894, under ether and an Esmarch bandage a longitudinal curved incision was made along the inner border of the joint, the flap reflected, joint opened, the capsule on the outer side freely incised, and the head of the metatarsal bone exposed and resected. The wound was sutured and the toe put up in a corrected position. Primary union was obtained, and at his discharge from the hospital, four weeks later, there was a fair amount of motion in the joint.

This was the first case in which I learned that the reposition was best effected and with less bony sacrifice by a liberal transverse incision of the outer part of the joint.

Case II.—E. K., female, aged forty-eight years, had suffered from double hallux valgus for ten years. The pain had been greater for the last three months, amounting now to nearly total disability. The deformity was especially marked on the left side, where the toe was placed at a right angle to the metatarsal bone, lying across the second toe. An ulcer existed over the head of the metatarsal bone.

October 31, 1894. Under ether, by a curved incision on the left foot, the joint was exposed, the overlying bursa cut away, and the head of the metatarsal bone excised. The tendon of the extensor proprius pollicis was cut and subsequently fastened to the median side of the first phalanx, the wound sutured over a small drain, and the toe put in a corrected position in a plaster-of-Paris bandage.

By a similar incision the joint was exposed on the right side, the bursa was removed, and an osteotomy performed just above the head of the metatarsal bone, but this not relieving the deformity, the projecting mass of the head was chiselled away. Dressing as on left foot.

September, 1896. Nearly two years afterwards the patient was reported entirely well with some toe motion, except that in bad weather the joints were painful.

Case III.—E. W., female, aged forty years. When twelve years old, this patient wore shoes which were too short, and she has suffered since, more or less, with pain in the metatarso-phalangeal joints of her great toes, both of which presented on inspection a moderate degree of hallux valgus. Walking was associated with much discomfort.

January 22, 1896. Under ether, a curved incision was made on the inner side of the joint, which was fully opened, and the capsule on the side next the second toe widely incised transversely. Both sesamoid bones, being displaced outward, were removed. The projecting hypertrophic portion of the metatarsal bone was excised, but the joint end proper was left. The tendon of the extensor proprius pollicis was divided and sutured to the inner side of the first phalanx. Wound sutured and dry dressings applied. Operation on both sides identical.

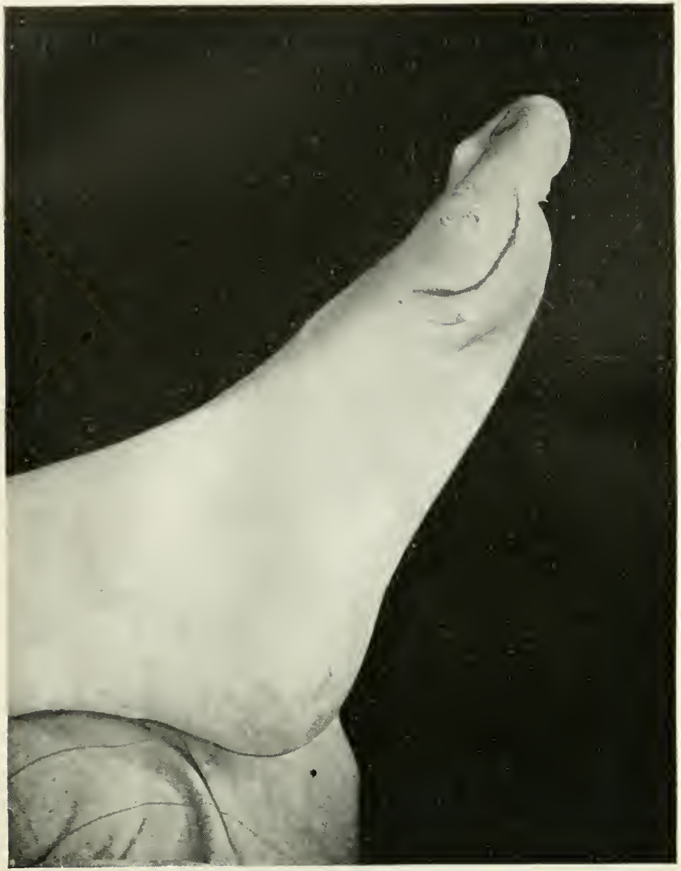
Both wounds suppurated and healed by granulation, the left in twelve days and the right in thirteen days. The suppuration did not involve the joints on either side. Two months later the patient was walking well, but pressure of the left shoe was somewhat painful. She has since passed from observation.

Case IV.—L. M., female, aged fifty-seven years. She had suffered for thirty years with increasing pain in right great toe and joint. Cauterization of an overlying callus produced a sinus, which still persisted, and led to a necrosed piece of the metatarsal bone, and also into the joint.

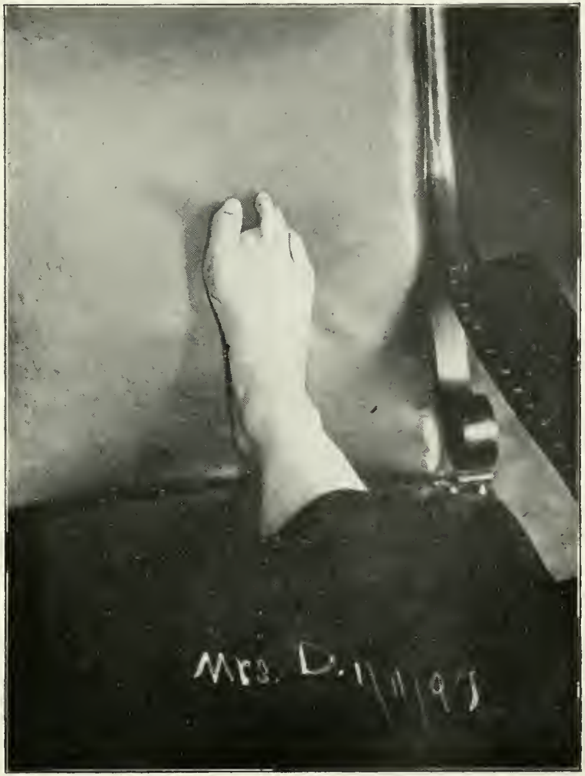
January 28, 1896. Under ether, through a three-inch curved incision, the joint was exposed, and the projecting hypertrophied bony masses of the metatarsal and phalangeal bones were removed, but the joint end was saved. The external part of the capsule was freely divided. The sesamoid bones were dislocated to such a degree that the inner one was on the outer side of the toe. Both were removed. The tendon of the extensor proprius pollicis was cut and stitched into the periosteum of the first phalanx on its inner and lower aspect. The wound was closed over a small drain.

Primary union was obtained and the patient was discharged in a much improved condition. In this case, not until the tendon had been cut and the sesamoid bone removed, was the deformity overcome.

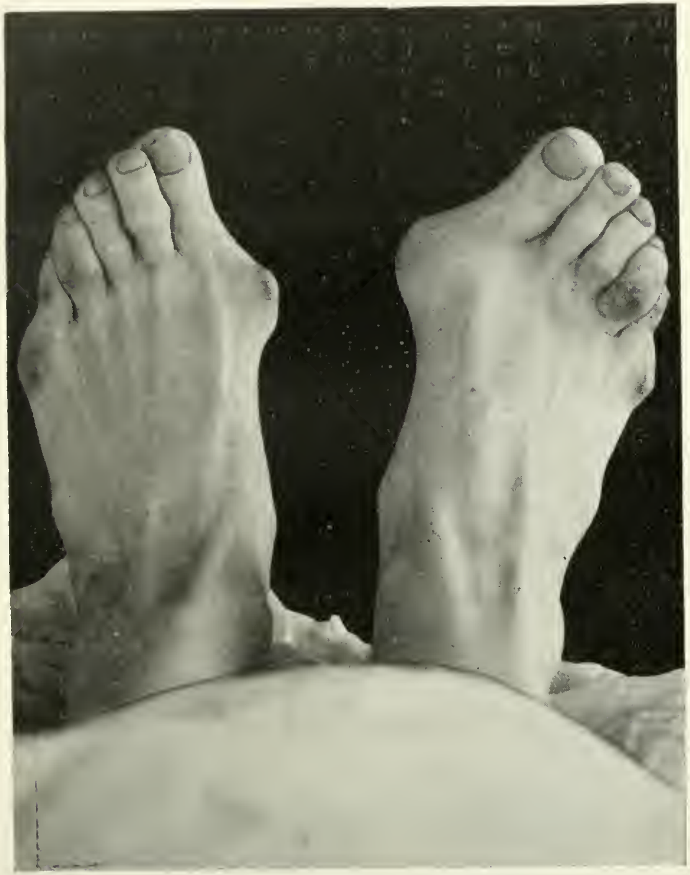
October 5, 1896. Eight months later the patient was examined and the toe was found to be in excellent condition. The passive motion of the joint perfect. The power of the extensor muscle of the great toe was much diminished on the affected side, so that the



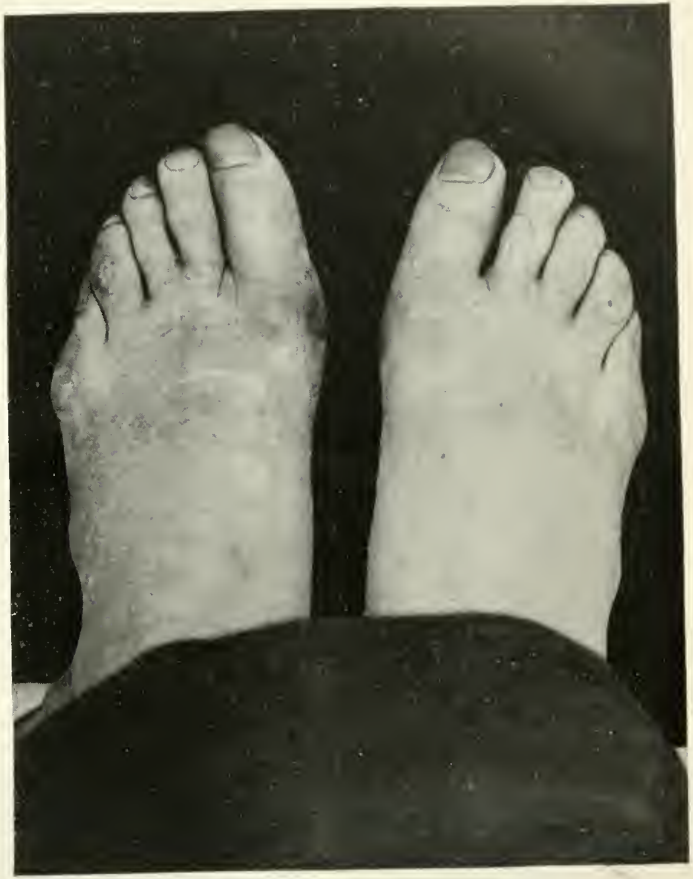
Case VII.—Showing line of incision.



Case X.—After operation.



CASE IX.—Before operation.



CASE IX.—Here the major part of the heads of the metatarsal bones were tip of the toe could be raised only about half an inch, but this did not interfere in the least with walking, which was perfectly normal either without or with a shoe. There was considerable pain for some weeks following the operation, but there has been none since.

CASE V.—N. G., female, aged twenty-five years, had experienced increasing pain in the joints of both great toes for four years. Double hallux valgus was well marked.

April 4, 1896. Under ether, and after the application of an Esmarch bandage, a curved incision was made, the joint opened, and the external part of the capsule divided. The sesamoid bones were removed and the tendon cut and transplanted as in the preceding case. The head of the metatarsal was almost completely removed. The same operation was performed on both sides. The right toe showed a tendency to backward dislocation on account of the tense tissue exterior to the capsule, though this had been freely cut. Both wounds were closed over gauze drains. A stitch abscess delayed complete union on either side. The result at discharge, six weeks after operation, was a good one, the patient walking about without pain, with a little motion in the resected joint.

CASE VI.—M. O., female, aged twenty-three years. A bunion developed three years previous on the left foot, followed by increasing deformity and pain. Right foot similarly affected, though to a less degree.

April 24, 1896. By the house surgeon, Dr. La Fetra, an operation was performed upon both feet exactly as described in connection with Case V. Primary union followed with a good result. In both these cases, V and VI, the loss of bone which was necessitated was much less than results in the older operations.

CASE VII.—M. C., female, aged forty-two years, had suffered for nine years with a bunion of the left foot, which had discharged pus for the last two years. Hallux valgus well marked.

May 8, 1896. The usual operation was performed. That is to say, a free division of the capsule, cutting off laterally of the hypertrophied bone, removal of the sesamoids, transplantation of tendon and saving as much of the bone end as possible. This conservation amounted to two-thirds of the articulating surface. Primary union was obtained and the function of the toe, at discharge from hospital in three weeks, was almost perfect.

CASE VIII.—Louisa L., aged twenty-three years. Long-existing double hallux, scarcely able to walk for past four months.

November 7, 1896. Operation; curved incision; bursa dissected out. Exostosis at inner side of head of metatarsal bone cut off, joint opened, when erosions were found over the metatarsal articular surface. The inner side of the capsule was freely divided and the sesamoid bones, which were both dislocated inward, were removed. The toe then came into fairly good position, and was held *in situ* by the transplantation of the extensor tendon; but this not sufficing, the long flexor was also cut and fastened to the inner side of the first phalanx and to the extensor tendon laterally. The toe was thus retained in good position without any sacrifice of the articulation.

The right toe was operated in the same manner, except that only the extensor tendon was transplanted. Recovery was good with motion at the joint.

Case IX.—Julia C., aged twenty-nine years. Both toes were much turned outward, due to tight shoes in early life. The right bunion was inflamed and had been open for a month. Through the sinus rough cartilage could be felt.

Operation, January 11, 1897, by the House Surgeon, Dr. Taylor. An incision curving along the lower border of the bunion, with a horizontal extension at each end, was carried down on left toe to the bone. The flap, including all the soft tissues, was dissected upward, and the internal exostosis on metatarsal head trimmed off with a bone forceps.

The sesamoid bones, which were dislocated far outward, were removed with scissors. The dorsal extensor tendon was dissected out and cut near its attachment, and a loop of silk passed through its end as a tractor.

On attempting to place toe in desired position, resisting bands were felt on outer side and these were freely divided. It was also necessary to remove about one-third to one-half of articular surface of the metatarsal bone before the toe would stay in the desired position. The dorsal tendon was then pulled down and sutured to the periosteum at the inner side of the base of the first phalanx by three catgut sutures. The toe then, when left alone, maintained a good position. A small iodoform-gauze drain was inserted. The wound was sutured with fine black silk.

The right toe was treated in the same way; though about two-thirds of the articular surface of the metatarsal bone was necessarily removed. Each foot was dressed with a roll of gauze between great and second toe and a compress below to support the toe in its new position. A plantar splint was bandaged on to keep the foot quiet. The result was good. The patient walking about with fair comfort three weeks later.

CASE X.—Mrs. De L. was referred to me, January, 1896, by Dr. Walker. She had had her second toe of the left foot removed in England for an aggravated condition of hammer toe. With this was associated a very marked hallux valgus, the great toe resting on the bent second one. The deformity increased after the loss of the second toe. Pain in walking was considerable. The typical operation just described was performed, with the removal of the sesamoids and transplantation of the extensor tendon, and the joint end was saved. The outcome was excellent,—walking is easy and free from pain. She has been seen occasionally during the past year, and the fear that from the absence of the support of the second toe a recurrence might take place has not been realized; she has moderate motion, though but little that is voluntary.

The foregoing represents the results of operation in nineteen cases of hallux valgus in eleven patients. All were treated, with but two exceptions, by the method I have outlined. In six of these, kept under observation long enough to determine the point (six weeks to two years), motion to a positive degree was found in five; in three of these the metatarsal head had been excised. The best motion naturally existed where some of the articulation had been saved. In all the cases the cure, as to comfort in walking, was complete.

Remarks on the Foregoing Cases.—Some few points can be elaborated as of practical moment. Ullmann proposed, in this deformity, in order to accomplish his end, to make two incisions over the bunion parallel to the axis of the toe, one of which, the longer, to be nearly on the dorsum, and the other, shorter, on the under surface of the toe. A third oblique incision from below upward and forward, joins the posterior end of the under cut to the middle of the upper one, and at this junction the cut flexor tendon was to be joined to the extensor tendon.

This makes a double angular flap. Such an incision is not free from objection. For the scar from a hallux operation should be as much as possible free from pressure. If one palpates the metatarso-phalangeal articulation while the foot is within one's shoe it can easily be appreciated that a curved incision, such as I have employed (see Fig. 7), and starting in front at the hollow of the phalanx, running downward towards the sole, and encroaching but slightly on it, and passing backward and upward to the middle of the metatarsal bone will be comparatively free from subsequent shoe contact. Experience has borne out this expectation. The incision on the inner side of the foot also permits the more ready extirpation of the bursa, which is often a necessary step in the operation, and was resorted to in a majority of the cases here presented. Another point is that as the removal of the sesamoid bones usually is a little difficult, they should be seized by a strong forceps so that they can be twisted or held while dissection by the scalpel or scissors is carried out. It will be frequently found that the removal of the sesamoids will allow the tendons of the displaced flexors to resume their normal place, and that they will remain so, provided the toe liberation has been ample either by section of the capsule or by bone sacrifice, or by both.

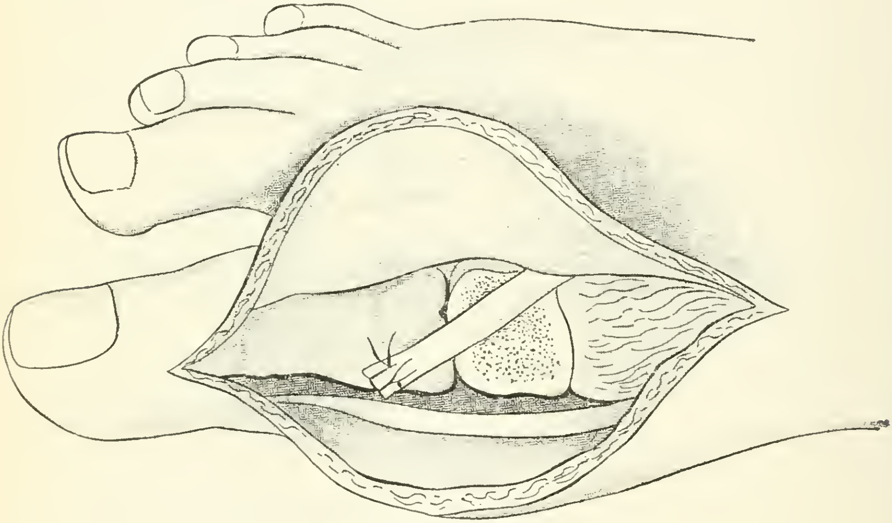


FIG. 7.—Showing Weir's curved incision.

The tendon suture is usually made with fine silk; at first, I let these hang out of the wound, to be pulled out by traction in a few days, but after several trials I abandoned this procedure and I now cut the ends short, and leave them *in situ.* For two or three weeks afterwards a pad of gauze is kept between the great and second toes to help hold the replaced toe in position.

A final sentence, and that a reiteration, is that no operation for hallux valgus is well done that does not, before suturing, allow the toe to rest easy in its restored position. If any tilting then exists its cause must be investigated and removed, or an imperfect result will ensue.

CONTRIBUTION TO TRAUMATIC ABDOMINAL SURGERY.

I. REPORT OF A CASE OF CONTUSION AND SUBSEQUENT GANGRENE OF A PORTION OF THE ILEUM, COMPLICATED BY LACERATION OF A HORSESHOE KIDNEY.

II. REPORT OF A CASE OF GANGRENOUS STRANGULATED HERNIA.

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IN a former essay on the subject of intra-abdominal injuries[1] I called attention particularly to two features belonging to them :

First, As compared to grave injuries of the viscera of the cranium and thorax, the comparative infrequency of those involving the intra-abdominal organs.

Second, The great difficulties in the way of anything like definite diagnosis.

It is true that through the aid of anæsthesia and the application of the physical sciences we are very far in advance in this direction of what we were as recently as twenty years ago; nevertheless, there are often such complex conditions present after many abdominal injuries as to baffle sometimes the best efforts of the most skilled and experienced. This comes through the widely diverse susceptibilities of different individuals as a leading factor, and the occasional anomalous arrangement and deviation in the development of the intra-abdominal organs.

The symptoms may be most misleading and deceptive, and decisive signs may be entirely wanting; thus in one case which came under my care in the Harlem Hospital, a man, after having been run over by an empty ash-cart, walked to the hospital, complaining only of a severe pain over his left groin, but he was dead within twenty-four hours; and, on autopsy, it was found that the ileum had been completely torn in two near the duodenum. Cases attended with marked collapse have come under my notice with no physical evidence of hæmorrhage or intestinal rupture, who, after rest and stimulants, shortly reacted, and in a few days had quite recovered their full health. These are confessedly uncommon instances, but they are not infrequently encountered in traumatic surgery.

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[1] Lancet Clinic, 1893, December 12, 20, and 28.

In the treatment of disorganizing trauma of the abdominal contents sufficient importance has not been given to the unaided powers of nature in effecting repair in a large number of injuries of the liver, the spleen, the kidney, or the hollow viscera. M. Paul Réclus is the only modern writer who has taken this subject up and dealt with it in detail from the stand-point of conservatism. It is yet an open question whether we ever are justified in opening the abdomen for the treatment of a hæmorrhage within it produced by a contusion. In serious injuries of the intestine with or without free bleeding, all are quite generally agreed that exploration and mechanical repair is the proper course to pursue; but surgeons should have the candor and honesty to confess that when perforation is absent the opening of the abdomen, the disturbance of protective adhesions, the displacing of firm blood-clots, and opening of large, lacerated, hidden, deeply-lodged blood-trunks may cut off the patient's only chance of recovery.

All these considerations were carefully deliberated on by me in the first case cited, whose history is as follows:

CASE I.—*Contusion of Abdomen, resulting in Gangrene of Small Intestine and Rupture of Horseshoe Kidney.*—On the morning of April 19 I was invited to see a case in consultation with Drs. Jonathan Lyons and John Dwyer, the former being the family physician, the latter the first consultant called. The patient, a young married man of twenty-seven years, had been injured three days previously by a kick from a horse, the hoof striking him with great force in the abdomen to the left of the median line, the force of impact having been spent on the left lumbo-iliac area.

Immediately behind where he stood when kicked was a grain-bin, against the corner of which his back struck as his body was driven backward by the force of the hoof's impact.

He fell immediately where he stood, and so great was the shock following that he was unable to rise unassisted. After stimulants were administered and he had rested about half an hour, he was carefully raised and carried home on an improvised litter.

When first seen by his physician, Dr. Lyons, the patient was suffering most agonizing distress over the entire abdomen. He was deathly pale; the pulse was thready and scarcely perceptible; the extremities were cold, and the whole body was covered by a free perspiration. Along with pain he complained of a sinking feeling with a sensation of nausea. Stimulants were freely administered hypodermically and *per rectum*, along with morphine in ample doses to subdue pain. As the patient was in great collapse at this time and the exact nature of the internal injuries was not clear, it was decided to await events.

The first night, April 16, the patient spent in comparative comfort, without vomiting. When seen the following morning, April 17, reaction was fairly well established, although there was great depression. The pulse was now 130 per minute; the temperature 101° F. Muscular rigidity of the abdominal walls was apparent, and they were everywhere highly sensitive to the touch. There had been no stool, and no urine had passed. On catheterization the bladder was found empty,—quite complete suppression. Vesical rupture was believed improbable, because just before injury he had micturated, and besides the hypogastric region was not impinged on. He was then having occasional spells of vomiting of yellowish mucoid substance. He was being maintained by iced champagne by mouth, with nutrient enemata. At this time he complained of very severe pain in the back, over the lumbar region, greatly aggravated by any straining or movement of the body. He also complained of a sense of numbness in both feet, with a sharp stinging heat in the sole of the left foot. His condition at this time, considering the gravity of his case, was regarded as fairly hopeful.

On the morning of the second day Dr. John Dwyer was called in consultation. Tympanites had become more marked, the temperature had augmented, the tongue was deeply coated and red-edged, and the pulse had gone up to 125 per minute. No urine had yet been found in the bladder, and large enemata of warm sweet oil failed to stimulate a fæcal evacuation.

On the 19th I first saw him. At this time he had the usual *ensemble* of signs and symptoms of well-marked peritonitis. I found over the muscles of the left side of the back a large patch of ecchymosis. This was the part that came in contact with the corner of the feed-chest when he fell. There was another deep discoloration over the left iliac region. He was taken out of bed and placed on a table, when a surface and rectal examination was made. From the site of the injury it seemed probable that the left kidney must have sustained serious damage, but the most cautious examination failed to support this view. It was found, by changing the position from side to side, that there was an effusion in the free peritoneal cavity. On auscultation of the intestinal zones, I was, I believed, enabled to pronounce the absence of intestinal rupture.

On introducing the index-finger far up into the rectum, its tip came in contact with a large mass pressing against it rather from before and laterally than behind, although the posterior bulging was beyond question. The relations of this mass with the rectum underwent no change on altering the position of the body. Though firm, it had a distinct, fluctuating sensation on deep pressure. At this juncture the bladder was again catheterized, when more than a pint of a clear, deep sherry-colored urine came away, greatly to the comfort of the patient.

At this time the pulse was 126 per minute; the temperature, $103\frac{2}{5}$° F., and respiration, 18. He was fairly well under the influence of opium and was perspiring moderately. He had the typical physiognomy of peritonitis, was very pale, and exceedingly weak.

After carefully weighing all the features presented by the case, I advised against operation, unless later fresh complications developed.

In addition to the tentative treatment, then employed, nothing further was recommended, except free mercurial inunction of the abdomen and regular catheterization.

Analysis of the urine gave alkaline reaction; specific gravity, 1030; no albumen and no sugar. Under the microscope an abundance of oxalate of lime crystals were found; there were some renal epithelia, several scattered red blood-corpuscles, some shreds of connective tissue, and scattering patches of coagulated blood.

Twenty-four hours later, on the evening of the fourth day, a marked improvement in his condition was reported. The bowels had freely opened and twice during the day he freely urinated.

The pulse had been reduced to 100 per minute, the temperature coming down to 99° F.; tympanites had diminished. Urine sent to me at this time was yet loaded with the oxalates, but, besides containing about the same proportion of blood-disks, now contained numerous renal epithelia and pus-corpuscles.

During the fifth night the patient was seized with an irresistible desire to get out of bed. The night was very warm, hence he got up, walked through two rooms to the parlor window, sat down for awhile, and then returned to bed again. Shortly after this he was seized with severe colicky pains in the abdomen, with vomiting and extreme thirst. The following morning I found him with feculent vomiting, a tympanitic abdomen, and great depression of the vital powers.

OPERATION.—*Laparotomy; Enterectomy; End-to-End Anastomosis with Murphy's Button; Fatal Secondary Hæmorrhage from a Laceration of a Horseshoe Kidney.*—At three o'clock in the afternoon, with the aid of my assistant, Dr. Davidow, Drs. Lyons and Dwyer, and two medical students, I opened the abdomen. When the patient was well under ether the abdominal walls were so relaxed that it was possible to quite distinctly define a large mass in the hypogastric region encroaching over on the left iliac fossa and spreading some distance to the right of the median line. This was firm and resistant to pressure, though quite immovable.

A large, eight-inch vertical incision was made parallel to the outer edge of the abdominal rectus. On division of the peritoneum there was a large issue of black, tarry, and coagulated blood. Passing my hand through the incision, I explored first the left renal hollow for the kidney, but could find none; then the hand was carried over to the right side, when the kidney here also was found absent.

Coming back to the site of incision, a considerable quantity of partly organized blood-clot was removed. Immediately under this was a coil of the small intestine, the seat of three broad, gangrenous patches.

In one place the gangrenous area nearly encircled the entire intestine; a second was of an oblong outline, two inches long and a little more than an inch wide; the third was about the size of a nickel.

In none of these was there perforation; the peritoneal coat, though necrotic, was not opened, the underlying muscular and glandular coats having entirely broken down. The segment of damaged intestine, six inches long, was about eighteen inches from the ileo-cæcal valve.

This was quickly drawn out through the incision, six inches of the intestine cut away, when an end-to-end anastomosis was made with the Murphy button.

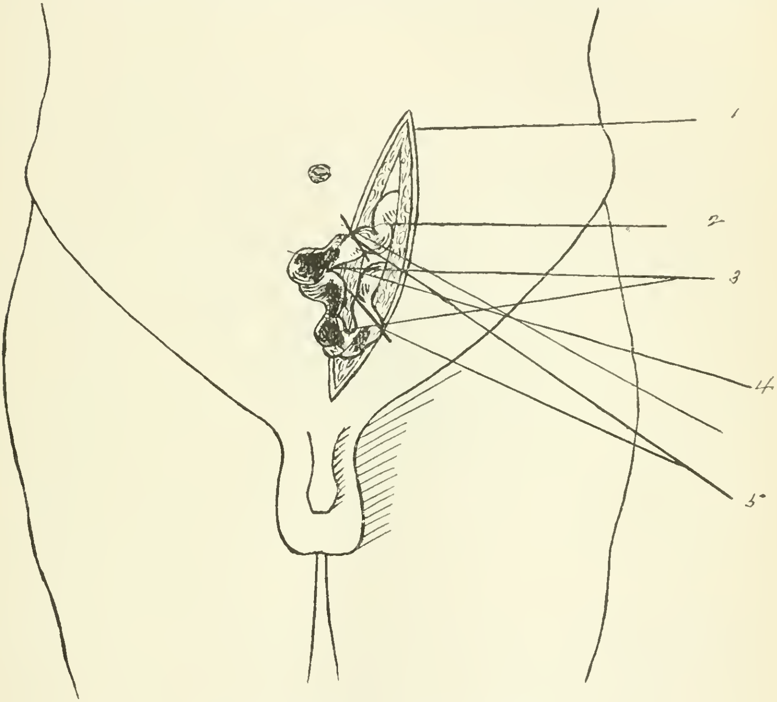

FIG. 1.—Showing condition of the ileum.
1.—Incision.
2.—Small intestine.
3.—Segment removed.
4.—Patches of peripheral gangrene.
5.—Lines of resection.

The intestine was now returned, but there remained a fulness over the sacral eminence, with masses of blood-clot on either side. Pressing the intestine aside, it was found that the patient had a horseshoe kidney. As the pelvis was being sponged out, he began to vomit violently, causing some coagula to be displaced, when a large gush of a dark-colored blood welled up. The blood seemed to spring from the lower part of the ectopic renal tissue, probably from a laceration of the renal vein. The bleeding was so free and its source so deep that it was impossible to determine exactly the opened vessel, although the renal tissue was extensively lacerated. At this moment his pulse failed, and mortal syncope supervened, the patient dying before the incision in the abdomen could be closed.

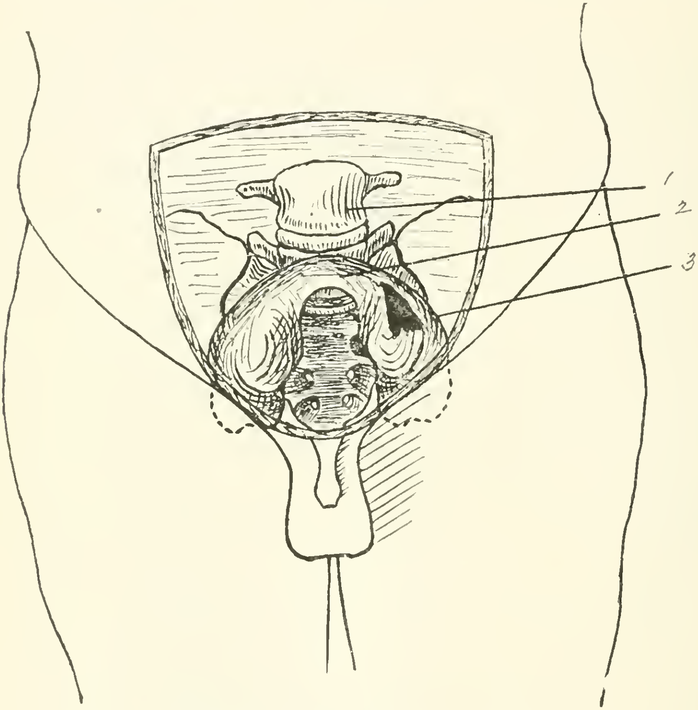

FIG. 2.—Showing position of horseshoe kidney and the site of its laceration.
1.—Last lumbar vertebra.
2.—Horseshoe kidney.
3.—Laceration.

The salient features in the above case, it strikes me, which are of unusual interest are, first, non-perforative gangrene of intestine, consecutive to severe contusion, and, secondly, the situation and structural arrangement of the renal tissue; one type of visceral ectopia so commonly witnessed in abdominal operations.

The second case was another type of abdominal lesion dependent on a combination of pathological and traumatic influences. It was a case which belongs to a not uncommon class, much less frequently seen now than in former times, and is reported here only because of several quite unique features in the morbid anatomy, and the technique in making anastomosis after intestinal resection.

The case was one of gangrene of the bowel consecutive to strangulated inguinal hernia. A diligent search of the literature of English, French, and German surgery, through published works and medical exchanges for the past twenty years, has failed to disclose any pathological lesion as a complicating feature of strangulated hernia precisely like this one.

Gangrene of the intestine, with or without perforation, in strangulated hernia, generally supervenes in consequence of delay in reduction by operation, or, what is perhaps most common, from protracted, misdirected, or excessive force in taxis. When extensive and well-defined gangrene of the intestinal wall is discovered in strangulated hernia, we are forced to decide on one of two measures.

The first is the establishment of an artificial anus, fixing the perforated bowel *in situ;* the second is the immediate resection of the diseased area of the intestine, and re-establishment of the fæcal current, by an end-to-end or lateral anastomosis. Except when the patient is in great collapse, the latter is always to be preferred.

In the present instance all varieties of plates, rings, and buttons were eschewed for the simple "in-and-out" suture, applied according to the method of Connell.[1] This suture, for its ease of execution, rapidity of insertion, and security, certainly is unrivalled in intestinal anastomosis.

Murphy's button's great claim for preference in intestinal anastomosis has been the reduction of operative time; but the

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[1] Medical Record, September 17, 1892, p. 335.

Connell suture can be inserted much more quickly than this apparatus, though it can be understood that there are several situations in the course of the intestinal canal in which this suture would be impracticable of application, but the button might be used with advantage.

CASE II.—*Gangrenous Strangulated Inguinal Hernia; Resection of Bowel; Enterorrhaphy; Recovery.*—On the evening of November 11, 1896, I was requested by Dr. Charles F. W. Horn, of this city, to go with him and operate on a case of strangulated hernia. The patient was a young man, twenty-eight years old. He always had enjoyed good health, never suffering from any infirmity except a hernia on his right side. This he had had for about eight years. At first it was easily reducible and could be securely trussed; but of late, at times, he had noticed that it came down in larger volume, was reduced with more difficulty, and would partly slip down under the bulb of the truss. For about three months he had discarded the truss, and allowed the hernia to remain unsupported. He stated that, on retiring at night, the extrusion would disappear, to again descend some hours after he went about in the morning.

On the morning of November 7, after it came down, it was more painful than usual. He now tried to reduce it himself, but failed. He applied lotions and poultices and only summoned medical aid four days later. When he came under my notice he was in a state of great exhaustion, the skin pale, the extremities cool, the features pinched, the pulse 140 per minute and thready, the temperature was 104° F. He lay on his back with his knees drawn up in great distress. Thirst was intense and vomiting almost incessant. The dejecta had a distinct fæcal odor. His abdominal walls were rigid and widely distended by tympanites. The scrotum was enlarged to nearly the size of a fœtal head, was of a deep red hue, at the base pointing, glazed, and discolored, as though about to burst. Its whole surface gave a distinct sense of fluctuation, and on coughing or straining no impulse was transmitted to the hand. The left testicle could nowhere be detected. Without the clinical history in this case, one would have been strongly inclined to view the scrotal enlargement as inflammatory, degenerating into a suppurative formation.

The local condition of the parts with the profound constitutional disturbances pointed to mechanical obstruction, with probable gangrene of the bowel.

Under ether a long incision was made, extending from about two inches above the inner inguinal ring down along the course of the cord to the base of the scrotum. This fully exposed the sac from its neck to the bottom. This was of a bronzed, mottled color

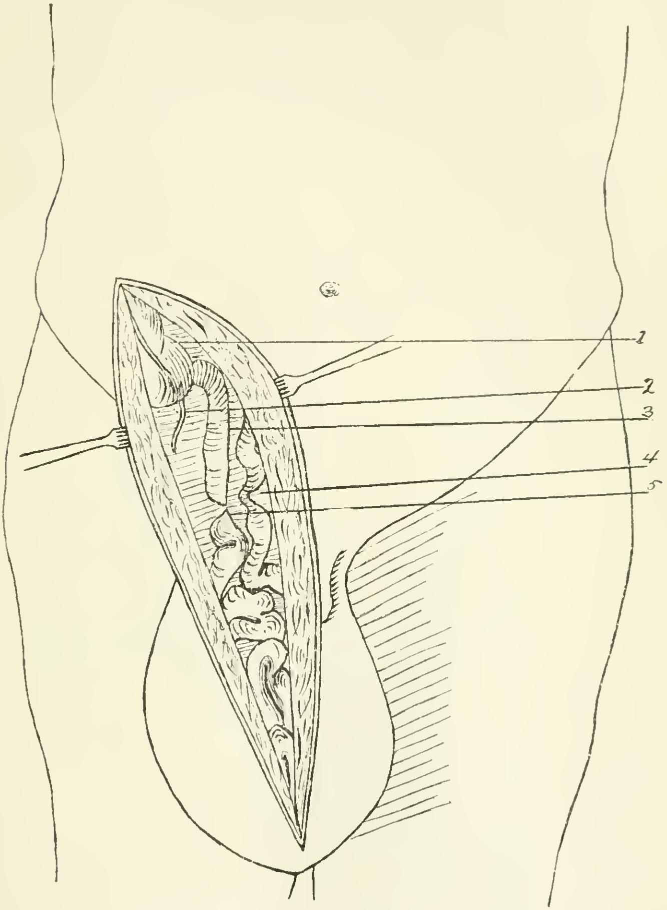

FIG. 3.—Showing contents of sac after incision.
1.—Cæcum.
2.—Appendix.
3.—Distal end of small intestine.
4.—Stenosed proximal end of intestine.
5.—Compression gangrene and complete division of intestine at point of strangulation.

and very tense over its entire surface. On its posterior surface, firmly incorporated with it, was the tunica vaginalis, enclosing a small, flattened, undeveloped testis. The sac was now widely opened, when a larger quantity of dark, foul-smelling fluid escaped, exposing a larger mass of intestine, which at its lower curvature was ruptured completely through. On the inner surface, farther up, another gangrenous perforation was found. (Fig. 3.) At this stage of the operation his general condition was fairly good, and it was decided to do an intestinal resection and an immediate anastomosis.

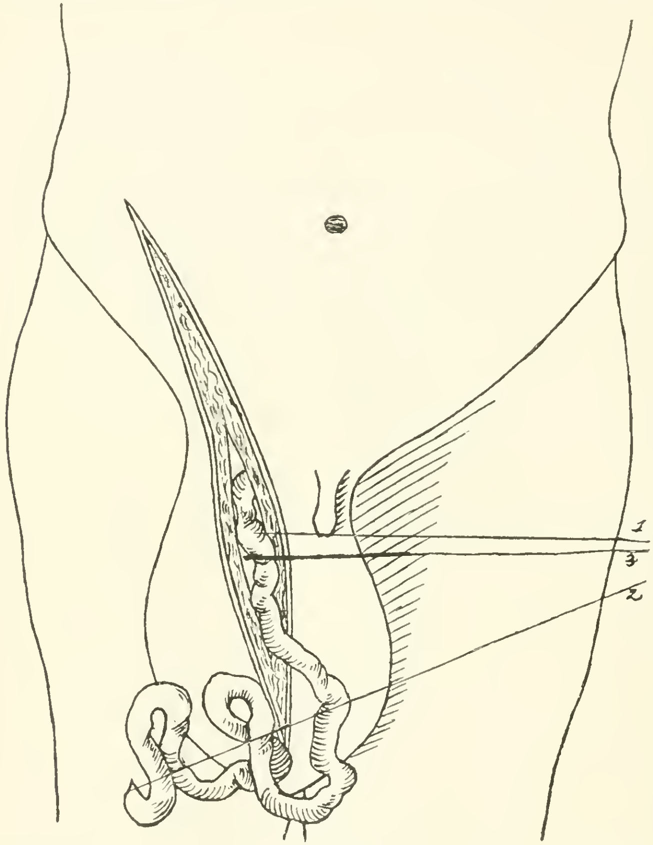

FIG. 4.—*1.*—Free loop of intestine escaping on division of the peritoneum.
2.—Complete closure of free end of intestine by adhesive inflammation.
3.—Peritoneal cavity.

As I raised the intestine preparatory to resection, I found that at the point of constriction one loop of it had been completely cut in two by pressure necrosis. This was the distal end at a point about five inches from the ileo-cæcal junction.

This permitted me to lift the entire intestine out of the sac, its continuity with the alimentary canal being preserved at its proximal end only; although even here a semicircular constriction had made a deep indentation through the peritoneal tunic. (Fig. 4.) At this stage two unexpected difficulties presented; the first, being the great hypertrophy of the mesentery, the vessels of which being so much enlarged that the usual loop ligature was quite useless in cutting off the hæmorrhage. This necessitated the tedious process of separately ligaturing all the larger terminals of the mesenteric artery.

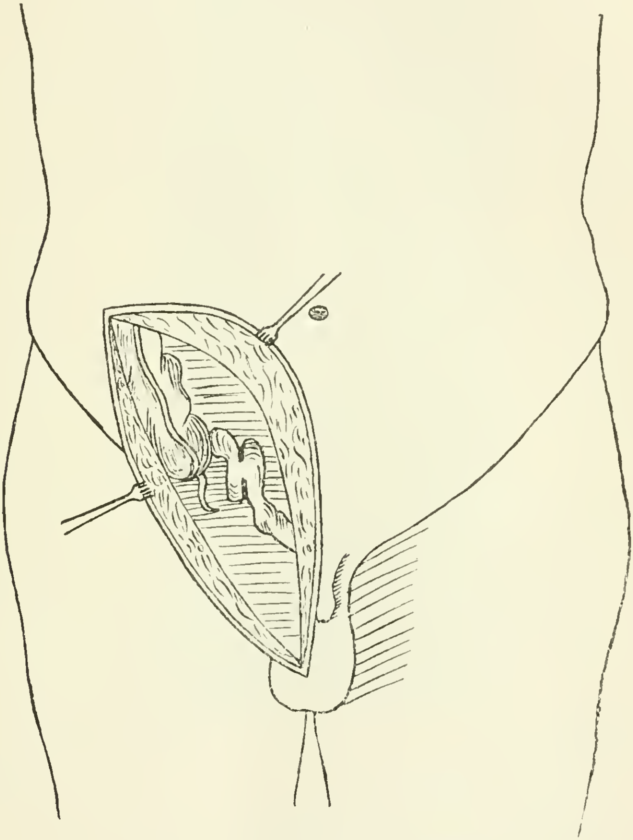

Fig. 5.—The anastomosis as completed.

The next difficulty was with the distal or cæcal end of the gut; for being held by the fixed caput coli it would not come down in sufficient length for the necessary manipulation of an anastomosis by the free suture. In order to obviate this difficulty the incision was carried up through the abdominal wall four inches. This exposed the appendix and base of the cæcum.

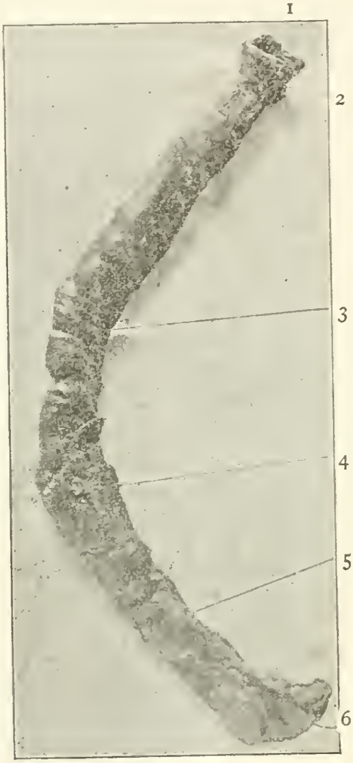

FIG. 6.—Showing detached gangrenous loop of small intestine.
1.—Divided proximal end.
2.—Point of cannular constriction.
3.—Perforation over covered surface.
4.—Perforation over lateral border.
5.—Thickened mesentery.
6.—Point of spontaneous division at seat of strangulation, closed.

The entire extruded coil of gangrenous intestine, measuring twenty-six inches, was now removed. The proximal end of the intestine was turned on its axis in the descending planes, in order to bring it along-side the short, fixed, distal end. A four-inch incision was made through the walls of the centre of the intestinal cylinder and a lateral anastomosis performed. (Fig. 5.) The scheme of coaptation was carried out according to Connell's directions with the in-and-out overlapping stitch. When this was completed, I reinforced the whole by a series of six interrupted sutures.

The bowel was then replaced within the abdomen, and two deep sutures were passed through the upper end of the incision in the abdominal wall, but the entire hiatus was left open in the scrotum and from the base of the cæcum, in the cavity of the peritoneum, the whole having been packed with sterilized gauze. The patient was returned to bed in fairly good condition. The operation occupied one and three-quarter hours.

He passed a fairly comfortable night, but the next day tympanites was rather more marked, and he was unable to urinate.

There had been a large serous discharge from the wound, of a strong gangrenous odor. Dressings were changed, iced champagne ordered, and it was directed that one ounce of mercurial ointment be rubbed into the abdomen. Enough morphine was given to secure comfort, rest, and freedom from pain.

During the second night after operation he had two large alvine discharges and passed his urine freely. The following morning his temperature was 100° F., his pulse 95, and respiration normal. His ultimate recovery was thereafter uneventful and complete. For some days there were large masses of gangrenous material thrown off from the wound; but granulation, contraction, and solid union of the wound were rapid.

He is now, nine weeks since operation, in vigorous health, with perfect digestion, and back again at his usual occupation of a laundryman.

As this case was one in some respects quite unique, it may be well to call attention to a few of the more salient features connected with it.

To begin with, the patient was a Chinaman, a race of vegetarians, notoriously abstemious in their habits.

The late W. S. Savory, the distinguished surgeon of St. Bartholomew's Hospital in London, has called attention to the greater physical endurance and vitality of the Eastern races, who maintain themselves chiefly on vegetable diet. Surgeon-Major Keegan, of the British army in India, has noted the same characteristic. And, in Larrey's "Memoirs" special attention is directed to this by the great French surgeon. He especially observed this striking contrast between the wounded Europeans and the Arabians after the siege of Acre.

This man's vitality certainly impressed me as most extraordinary, for although nothing was neglected in the technique of operation, yet, when it is remembered that more than two-thirds of a yard of his intestine was necrotic, that he had general peritonitis and sepsis, when he was operated on, and his strength was at a low ebb, it seems extraordinary that he could recover.

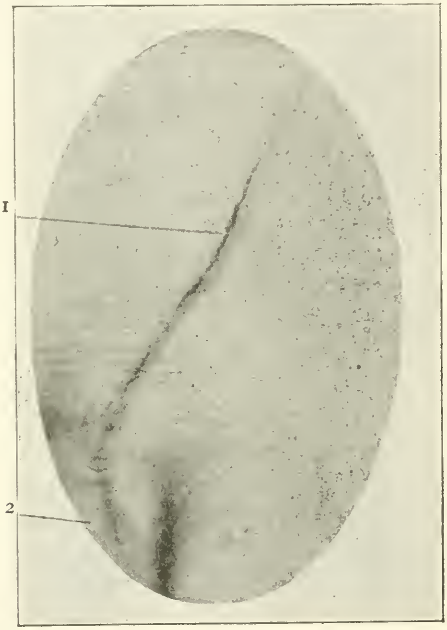

FIG. 7.—Position reversed in photographing, three months after operation.
1.—Cicatrized long, linear incision; ileo-inguinal up over the cæcum.
2.—Scrotal terminus of incision.

It is now a well-established rule in surgery to do an immediate intestinal resection in gangrenous hernia, except *in extremis*. An artificial anus, through any part of the ileum, interferes with proper digestion, and necessitates another later operation, which for various reasons often fails of success and again imperils the patient's life.

I did not undertake any so-called " radical cure" of hernia in this case, believing that we do quite enough under these circumstances to rescue our patient, and leave that for a later consideration ; although in this case the removal of so much intestine will tend to obviate a tendency to another hernia. It is my conviction that, independent of secure anastomosis, two things were done which added largely to this patient's chances of recovery. The first was leaving a wide breach in the tissues for the escape of peccant discharges, and using simple gauze drain. To stuff a large vascular surface with iodoform gauze is not free from the possible danger of poisoning by absorption.

Secondly, mercurial inunction is a therapeutic agent of marvellous potency in peritoneal inflammation of nearly any description. When there is no perforation of the intestine or large pus accumulation, its action is prompt and positive. Intestinal paresis disappears, the bowels open, tympanites and muscular rigidity pass away. No doubt there is some danger of salivating, but the older authors alleged that mercury never salivated while inflammation is present. That certainly has been my own experience, for in no instance have I seen stomatitis after the employment of mercury in peritonitis or meningitis.

Last, but not least, is the Connell suture. I am sure that in time it will be preferred to any means now within our reach. A few cambric needles and a spool of silk are all that are needed. It can be applied in less time than any apparatus whatever, costs practically nothing, and is within the reach of all.

This was my first case to test it on man, although I had used it at least twenty times before on dogs.

SOME FRACTURES OF THE LOWER END OF THE RADIUS AS SEEN BY THE RÖNTGEN RAYS.[1]

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WE were certainly justified in supposing that our knowledge of fractures had nearly reached its limit; but the Röntgen rays have opened up new fields for investigation, and we find that there is still much to learn. We are enabled to see broken bones in a way we have never seen them before, and a complete new set of data must now be accumulated and reviewed.

The skiagraph will be of particular benefit in fractures of the lower end of the radius, which have so often puzzled surgeons in the past. Sometimes the diagnosis is obscure, sometimes reduction seems impossible, and the reason cannot be detected, while at other times it is difficult to tell, especially in the presence of swelling, whether the bones have been properly set or not. In the future these problems will be much easier of solution. The peculiarities of the fracture can be minutely examined before it is reduced, and afterwards while confined by splints, thus controlling the work of the hands by direct observation. If the Röntgen rays should accomplish nothing further than this, they would be of great benefit to humanity.

The following cases present some features of interest. The excellent skiagraphs were taken by Mr. LaCombe and Mr. Johnson, of the Mountain Electric Company, of Denver, and developed by Mr. Haffner, of the Williamson & Haffner Engraving Company, to which gentlemen I desire to express my obligations.

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[1] Read before the Pan-American Medical Congress, November, 1896.

A boy, about ten years of age, fell from a height onto his hands and fractured the lower extremity of each radius. There was marked "silver fork" deformity, with flexion of the fingers and inclination of the hands to the radial side. A diagnosis of probable epiphyseal separation was made. Complete reduction was easily accomplished by dorsal flexion of the hands upon the wrists and pressure applied to the distal fragments. The forearms could then be shaken until the hands jerked to and fro with considerable violence without reproducing displacement of the fragments. A dorsal splint was employed, reaching to the tips of the fingers and padded at its extremity so as to maintain volar flexion at the wrist. The apparatus was purposely made large and clumsy, in order, as far as possible, to prevent the boy from using his hands. Following reduction there was no pain and little tenderness.

The wrists were examined every day or two in order to note any tendency towards displacement. In about a week a slight deformity was seen upon the right side, which was attributed to swelling of the soft parts. In a few days this had increased to a considerable extent. Chloroform was administered and reduction of the deformity attempted without success, although much force was employed in combination with extension, dorsal flexion, and direct pressure. After several days, the deformity in the mean time having increased, a second attempt at its correction was made, likewise without result. It was found impossible to even rebreak the bone with the amount of force which could be applied by the hands alone.

The little patient ultimately recovered, however, with a functionally perfect right wrist, although with moderate deformity. It is impossible to detect that the left wrist has been broken.

During treatment, the boy, in spite of repeated warnings, insisted on using his hands when he imagined himself free from observation. On several occasions he reached backward from his bed and pulled open a drawer with his right hand. At the time this was thought to account for the redislocation of the fragments. It was difficult to understand, however, why the bones could not be replaced, or, in fact, moved at all; and besides this, when closely questioned the patient said that at no time had he felt any pain or been conscious of anything slipping.

About fourteen weeks after the injury two skiagraphs of the wrists were taken, one in the prone and one in the semiprone position. Cartilage being easily penetrated by the Röntgen rays, the epiphyseal lines of the bones of the forearm are clearly shown, as are also those of the metacarpal bones and the phalanges. The incomplete ossification of the bones of the carpus is also indicated.

In the prone position of the forearms the epiphyseal line of each radius is the same width throughout, one bone being apparently as perfect as the other. In the semiprone position, however, the anterior half of the right epiphyseal line is obscured by a dark shadow, representing, undoubtedly, a growth of new bone, and the anterior border of the epiphysis is tilted downward from the shaft.

It may be that the injury alone was responsible for this excessive growth and premature ossification of the epiphyseal cartilage; or it is possible that the extent to which the boy insisted upon using his hand may have had something to do with it.

The skiagraphs made it at once clear why no amount of force or method of manipulation would cause the disappearance of the deformity; and why the boy in spite of an apparent redislocation of the fragments had been free from pain and tenderness.

In several treatises upon surgery, brief mention is made of the fact that subsequent deformity may appear after separation of the epiphysis of the lower end of the radius; but in most text-books the question is entirely ignored, although its importance in prognosis is certainly considerable. The only deformity mentioned, however, is that produced by cessation of growth on the part of the radius, due to premature ossification of the epiphyseal line, while the ulna continues to elongate, thus twisting the hand to the radial side. This is entirely different from the case reported above, in which the abnormal position of the bones is due to stimulated growth and not to inhibited growth, although the latter may take place later.

I know of no way in which this misfortune can be prevented unless something may be accomplished by keeping the broken bone absolutely at rest. It is perhaps possible that a marked

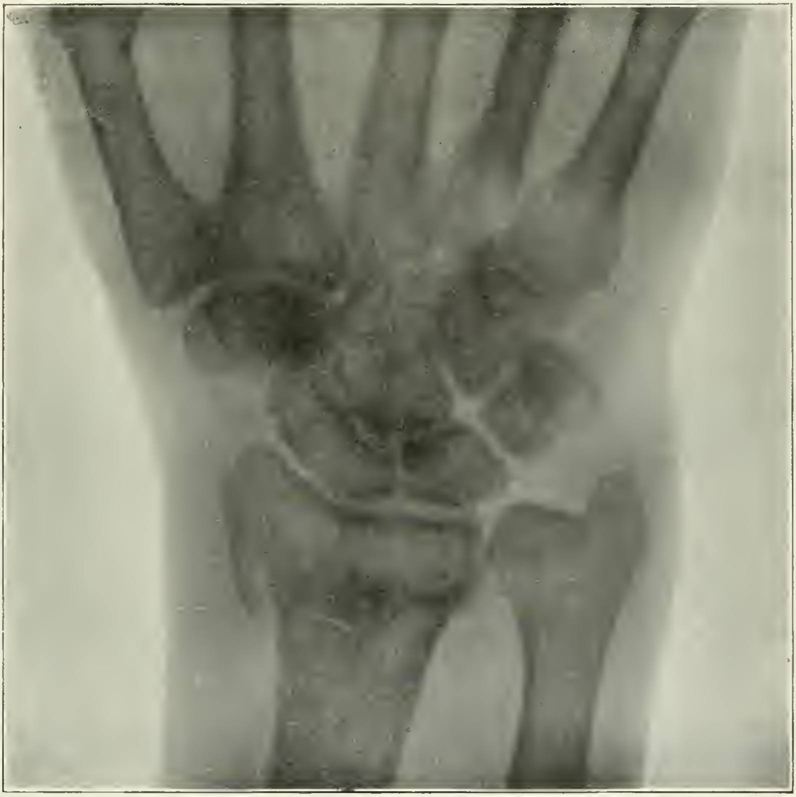

FIG. 1.—Impacted fracture of the lower extremity of the radius. Skiagraph.

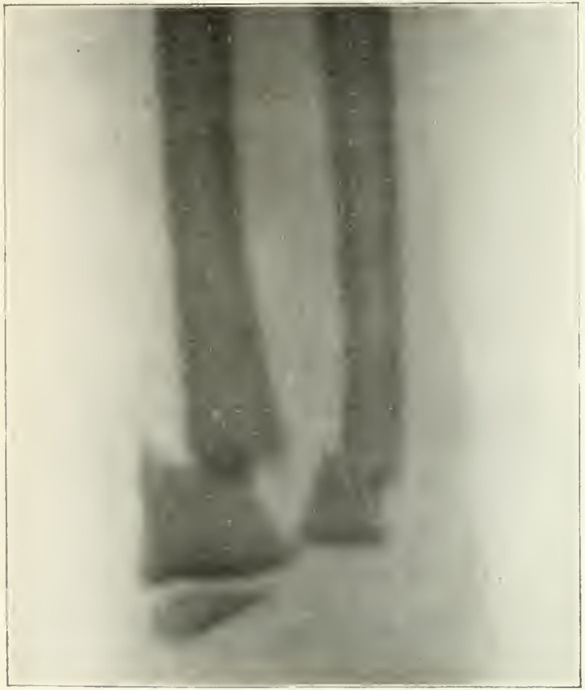

FIG. 2.—Fracture of both bones of the forearm near their lower extremities. Skiagraph.

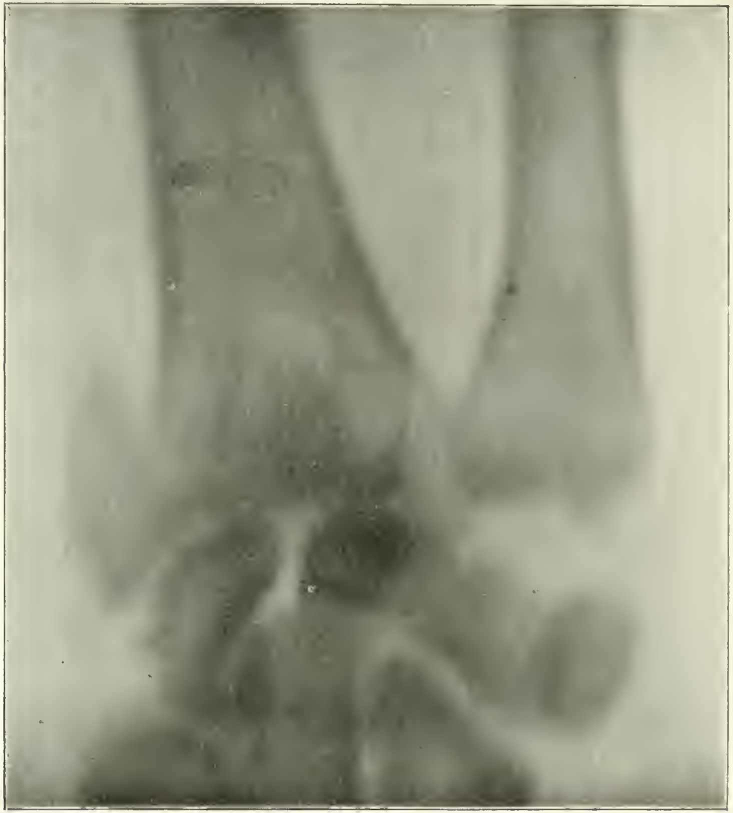

FIG. 3.—Fracture of the styloid process of the radius and of the ulna. Skiagraph.

deformity could be lessened by stimulating the bone-producing power of the remainder of the epiphyseal line through injection of Lannelongue's 10-per-cent. solution of chloride of zinc; but this is theoretical only, and more harm than good might be done. Seeing that the epiphyseal line seems to be at least partially ossified upon its anterior surface, it may be that the remainder which is unaltered will cause a more rapid growth of the posterior half of the bone, thus tilting the epiphysis back into its normal position. The efficacy of rebreaking the bone would be, to say the least, doubtful, while operative interference might so damage the cartilage as to stop all growth. In case of great deformity an osteotomy might be made higher up.

Case II.—A lady, aged fifty-two years, fell and injured her wrist. Neither mobility nor crepitus were present, and deformity was doubtful. The injury was examined by several physicians, who regarded it as a sprain. Dr. Charles Dennison, however, maintained that an impacted Colles's fracture existed, and in order to sustain his point the wrist was at once skiagraphed. The picture (Fig. 1) showed a typical impacted fracture, in which the upper fragment had been driven just far enough into the lower to lock them firmly together. The value of such a demonstration to physician and patient is considerable, as regards both prognosis and treatment.

Case III.—A boy, six years old, fractured both bones of the forearm near the wrist. The injury was easily diagnosticated, chloroform administered, and the bones brought into position with apparent accuracy. Unluckily for all concerned, a skiagraph was then obtained, with the splints in position. (Fig. 2.) The epiphyseal line of the radius is well shown. Most of the carpal bones have not yet undergone ossification. It was at once evident, to the surprise of the surgeon and the consternation of the parents, that the fragments were far from being accurately adjusted. It was suggested that the fracture be immediately reset, but this was not consented to, as the child was nervous and had not taken the anæsthetic well on the first occasion. Several other physicians were consulted, including myself, who unhesitatingly said that unless something were done a bad result would in all likelihood be obtained. The wrist, however, was left as shown in the illustration, and in spite of this it came out in almost perfect condition, both as regards appearance and function.

It must often be true that when we imagine we have placed the fragments of a broken bone in perfect apposition, they may not be so after all, and yet the result be good, nature happily being capable of smoothing out many inequalities.

In this connection it is well to remember that skiagraphs, until we become better acquainted with their significance, may be productive of needless anxiety and controversy. We must learn to estimate what we see in the light of nature's capacity for repair, and that in many instances is surprisingly great. Surgeons might be caused much embarrassment by patients bent on mischief. In a suit for malpractice, for instance, a skiagraph of the character of Fig. 2 could not fail to produce a marked impression.

A rare form of fracture of the lower end of the radius is the splitting off of the styloid process together, perhaps, with a portion of the shaft. This is well illustrated in Fig. 3, the skiagraph being taken through the wooden splints, after the fracture had apparently been well reduced. Although the diagnosis was at first obscure, a glance at the picture is sufficient to establish it with certainty. This is a case in which the methods ordinarily employed in the reduction of Colles's fracture are inadequate, and it would be useless to torture the patient by their employment. In fact, it is difficult to say just what form of treatment would be most efficient. The hand was left just as seen in the illustration, and the result was excellent.

TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, January 13, 1897.

The President, Frank Hartley, M.D., in the Chair.

INCOMPLETE AND COMPLETE EXCLUSION OF GUT FOR FÆCAL FISTULA.

Dr. F. Kammerer showed a patient upon whom he had done unilateral and, finally, total exclusion of a part of the intestine for fæcal fistula. The patient was a man of forty-eight years, who, during 1895, had been operated on three times for appendicitis by a prominent surgeon. After the last operation a fæcal fistula had developed, from which almost the entire amount of fæcal matter passed. After an extensive operation at the seat of disease, to close the fistula, he had implanted the proximal end of the divided ileum into the transverse colon and closed the distal end. Six months later very little fæcal matter still escaped from the fistula, and after another attempt at closure by resection of the bowel at the seat of trouble, he reopened the abdomen and divided the transverse colon immediately before the implantation, thus entirely excluding from the fæcal circulation part of the ileum, the ascending and part of the transverse colon. This last operation was done about a month ago. The fistula was, of course, still discharging, but not fæcal matter. Whether or not another operation would later on be necessary the speaker did not venture to say.

Dr. Parker Syms said that experience with intestinal fistulæ must vary greatly. He had had fistula result in but one case after operating for appendicitis, and this case had been subsequently treated by another surgeon; but he had seen several cases in hands of other surgeons and had assisted them in operating for closure of the same. In those cases the adhesions had extended over only a small area, and in every instance it had been possible to separate them and to make a permanent cure by simple suture of the intestine.

Six or eight years ago he had closed two inguinal colotomy openings by means of Szymanowski's flaps with entire success. These colotomies had been done preliminary to resection of the rectum for cancer.

Dr. R. H. M. Dawbarn said he had had a case somewhat similar to the one reported by Dr. Kammerer in which he resorted to a device which he thought had had everything to do with preventing regurgitation of fæces along the excluded portion of the gut. It was a case in which he had united the end of the ileum to the transverse colon for cancer of the ascending colon, which had spontaneously caused a fæcal fistula in that region. The device consisted in passing a coarse, sterile silk suture, purse-string method, around the transverse colon, about three inches to the patient's right of the point at which anastomosis was made. It was drawn tightly enough to prevent fæces from regurgitating, but not tight enough to cause strangulation. It required but a minute or two to do, and he thought could do no harm in any similar case.

Dr. Kammerer commented on Dr. Dawbarn's method of preventing fæcal regurgitation, saying that he did not believe regurgitation of fæcal matter could be effectually controlled by the plan suggested by Dr. Dawbarn. Similar methods (suture of longitudinal folds of the intestine to one another) with the same end in view had proved a failure. He did not think that implantation and partial or total exclusion with suture of the divided ends of the diseased portion was a good procedure in cases of intestinal tumors, even if these cases were associated with an external fistula at the site of the tumor. Lateral anastomosis or implantation of the ends of the excluded intestine in the abdominal wall for free drainage in either direction seemed to him the better operation.

Dr. Dawbarn rejoined that Dr. Kammerer evidently forgot that Dr. Dawbarn had said that his case was quite similar to Dr. Kammerer's, in being one of *fæcal fistula* in the region of the ascending colon.

PLASTIC OPERATION FOR RESTORING LOWER EYELID.

Dr. R. H. M. Dawbarn presented a man, about fifty years of age, whose lower eyelid he had removed completely for epithelioma, and had made restoration by what he believed to be a new method. At any rate he had not been able to find any description of it in medical literature, nor had any of the members of this society to whom he had spoken about it seen it done. The two methods in common use consisted, in the one, in turning a flap down from the forehead, in the other, in turning a flap up from out on the cheek. In the case of the man presented, he amputated all of the lower lid down to the lower edge of the orbit, the part excised being in the form of a half-moon ; and the defect was repaired by making a semicircular incision with its convexity downward into the integument on the cheek directly beneath, and at the required distance below the orbital line to make a flap a little greater in depth (to allow for shrinking) than that of the lid removed. This, leaving the two ends of the crescent attached for nourishment, was slid directly up into the place which had been occupied by the removed lid. A second similar incision was made farther down and a second flap attached like the first, at both ends, and was slid up into the space formerly occupied by the first flap. With a little dissection of the skin still lower than both these half-moon incisions, the skin was enabled to fill the necessary space. To prevent the flaps from sinking down their edges were supported by carrying the sutures deeply enough to catch in the periosteum ; and also the free edge of the new lid was stitched at a few points, temporarily, to the edge of the closed upper lid.

The raw edge of the new lid was prevented from growing to the rather irritated ocular conjunctiva by intervention of a thin strip of gutta-percha tissue, which was left in place for a few days, until the eyelids were cut apart.

Allowing for slight scars, the result had been so perfect that he thought one would hardly notice that anything had been done to the eye when viewing it from a short distance.

ULNAR PARESIS FROM SHOT-WOUND OF ARM.

Dr. Willy Meyer presented a man, aged twenty-one years, who had been shot in the arm, in the summer of 1896, by fine buckshot from a distance of three to four feet. Evidently a large amount of shot entered the outer aspect of the arm near the elbow and were sought for at once by a surgeon in the country. Pretty free suppuration resulted. When Dr. Meyer saw the man, in September, there was marked paresis of the muscles supplied by the ulnar nerve and excruciating pain in the corresponding fingers. X-ray photographs showed that the shot remained mostly in or near the skin. On cutting down upon the nerve at the inner aspect of the arm near the elbow he found it bound down in a mass of cicatricial tissue. It was not easy to dissect it out, but it was accomplished, and many powder particles were found in its sheath. The nerve itself seemed normal. The wound was closed without drainage, primary union resulted, the pain disappeared, and the patient gradually regained strength in the muscles until now the condition was nearly normal, although the muscles had not yet fully regained their former size. While this result had been often attained after operation for paresis of the musculo-spiral nerve following fracture, the nerve having become adherent to the callus, he thought it might be of interest to show a case following injury of the soft parts alone.

SKIAGRAPH OF BULLETS IN THE BRAIN.

Dr. Meyer presented a second patient, one whom he had already shown at the Surgical Section of the Academy of Medicine, a young man who last summer had attempted suicide by shooting himself in the right temporal region with a pistol. Immediately after the shooting he was taken to Gouverneur Hospital, where he was trephined and the depressed portion of bone raised. No search for the bullet was made, as it did not seem to be in the neighborhood of the entrance wound. The patient recovered, so far as the operation was concerned, but motor symptoms developed in the left arm and leg which pointed to injury of the right Rolandic region. The patient afterwards entered the German Hospital and Dr. Meyer had some X-ray photographs taken, side and front exposure, which faintly, yet positively, revealed three foreign bodies in line with one another, two of them evidently the split bullet, the third either a part of the bullet or a splinter of bone. Two of the foreign bodies are situated on the one side of the median line and one on the other. It was regarded as a case beyond surgical relief, and nothing further was done. An interesting fact was the entire loss of hair over nearly the whole posterior half of the head as a result of the exposure to the X-ray. This accident and that of a burn of third degree were known to occur occasionally after the use of the ray.

OPERATIVE TECHNIQUE FOR CANCER OF THE BREAST.

Dr. Meyer presented three cases showing the results of the so-called "Willy Meyer operation" for cancer of the breast. It was a singular coincidence that two years ago, in October, 1894, when he announced a paper to be read before the Section on Surgery of the

Academy of Medicine "on an improved method of radical operation for carcinoma of the breast," Dr. Halsted's operation, which was very similar, was published in the ANNALS OF SURGERY. Dr. Meyer had made up his mind to do the operation according to the method as he had mapped it out many months before, as soon as a case should present itself; by chance it came rather late (September, 1894).

The patients presented illustrated the method and the advantages of the operation. One specimen, the removed breast, with pectoralis major and minor muscles and all the glands and surrounding tissue attached, extirpated in one mass, was also presented.

The first incision was carried out posteriorly on the arm as far as the insertion of the pectoralis major muscle, another surrounded the breast as far as necessary, Because of the breadth of the upper skin-flap he sometimes divided it by another incision, running perpendicularly from junction of outer and middle third of clavicle to the former. He then cut off the insertion of the pectoralis major to the humerus and followed its upper border along-side the cephalic vein to the clavicle, where the muscle was cut off to the sterno-clavicular articulation. Likewise the insertion of the pectoralis minor muscle was cut off at the coracoid process of the scapula. He saw no reason for simply dividing, but otherwise leaving the pectoralis minor as was done in Halsted's operation. It was a cleaner operation to cut it off and extirpate it. The mass, including the tumor, was then dissected away with the glands in one piece. The lower border of the subclavian vein was prepared free. The last gland at the sterno-clavicular articulation was specially excised and handed to the microscopist. The vessels were caught by the two assistants as the surgeon proceeded with the operation, and always were divided between two clamps, thus shortening the operation and rendering it almost bloodless. Dr. Meyer was able to conclude the operation in from fifty minutes to an hour and a half. He so far had done it fourteen times. He saved a good deal of time by continuously using the knife and letting the assistants catch the vessels.

One point was emphasized,—namely, that the assistant must not make too much traction upon the muscle, particularly the pectoralis minor, when nearing the base of the whole mass at the costal cartilages and the sternum, lest it tear off the perichondrium and cause necrosis of the costal cartilages. If such an accident should occur, as it had in two of his cases, the defect must be covered at once by suturing the surrounding living tissue over it. If this be impossible, necrosis is bound to set in. Months will then elapse before the sequestrum is pushed off or can be removed.

Of the three patients presented the first one had been operated upon March 11, 1895. It was one of the two cases in which he had had the misfortune to have necrosis of a costal cartilage, and rather a long time was required to get perfect repair. In this case, as in the others, he covered the granulating surface at the site of the skin-defect, the third or fourth week, with Thiersch's skin-grafts taken from the thigh, under local anæsthesia with ethyl chloride. The grafts were put directly on the granulations. The latter were never scooped away. He could assert that when he had done the transplantation himself the grafts had always taken. This patient and all of the others had full use of the arm, and there was none of the so-called mutilation which had sometimes been spoken of in connection with this operation. One of the other patients, nearly seventy years of age, who was operated upon last summer, showed a like satisfactory result. The same was true of the other case which had first been operated upon for cancer of a supernumerary mamma in 1894. There was recurrence involving the breast, and the breast was radically amputated last summer.

THE SURGICAL TREATMENT OF HALLUX VALGUS.

Dr. Robert F. Weir read a paper on "The Surgical Treatment of Hallux Valgus," for which see page 444.

Dr. Willy Meyer expressed a preference for the operation for hallux valgus published by Riedel in 1886. It consisted in making a single incision upon the inner side of the toe extending from the head of the first phalanx to about the middle part of the metatarsal bone. Through this incision the bunion was extirpated and the bony prominence at the inner aspect of the head of the metatarsal bone chiselled away. The chisel was held parallel to the inner aspect of the metatarsus, its blade pointing towards the phalanges. The head of the first metatarsal bone was *never* cut transversely and removed; it was kept absolutely intact and always entirely preserved. At first he provided for drainage, but now closed the wound entirely. Gauze was placed between the first and second toes. No attention was given to the sesamoid bones and the tendons. In very obstinate cases there remained slight tendency for the toe to turn outward towards its fellows, but it had caused the patient no subsequent trouble. He had also resorted to this operation in suppurative cases, making use of the secondary suture. Of the fourteen cases thus operated upon by Dr. Meyer since 1888 all had proven satisfactory, and in view of the simplicity of the method he thought it deserved to be mentioned as one of the useful methods which should be resorted to in hallux valgus.

Dr. Dawbarn said that from a study of skiagraphs of two extremely bad cases, and from examination of all that he had thus far seen, he was convinced that the idea, that an exostosis had ordinarily anything to do with the pathology, was incorrect. The prominence is the distal end of the normal first metatarsal, which bone is abnormally directed inward. The corresponding first phalanx is subluxated outward, but this latter bone has nothing to do with the prominence. The tendon of the *extensor proprius* is contracted, and this latter fact renders insufficient a mere chiselling away of the natural tuberosity near the head, or even a slice from the inner side of the head itself, both of which plans are used. The tendon once having become shortened, the abnormal angle between the two bones thus involved tends continually to increase thereby with greater and greater ease. A further objection to a partial bony excision is the fact that such work, if it enters a joint, is everywhere less likely to result in free movement than is a complete excision. Take the elbow excision as an instance of this.

The operation performed by Dr. Dawbarn in eleven cases was a very simple and easy one. It had given his patients entire satisfaction and with normal gait and without limping. A half-moon flap incision was made, embracing the joint, upon its upper aspect; the convexity of the cut being outward, and touching, but not cutting, the displaced extensor proprius tendon. Thus much more room for work was obtained than by any kind of straight incision; and the scar was so placed as not to be irritated by the shoe. Next, the joint was freely opened, and the head of the metatarsal dissected from the soft parts by a few strokes, when it (the head) was entirely removed by the use of the cutting bone forceps.

The toe is straightened on a narrow, gauze-padded sole-splint; and a gap left into which the thumb could be placed. Over this the flap is sutured; and the wound fills with a Thiersch blood-clot, which quickly organizes, and soon permits passive and finally active motion.

The tendon is not attacked at all. This would be needless, for as the toe shortens a little—about one-fourth inch—the tendon returns to its natural position; and neither are the sesamoid bones touched.

Dr. Dawbarn objected to that form of operation in which the base of the first phalanx was removed as being unnecessary work, which would also have to be done very cautiously and subperiosteally, as otherwise the attachments of several muscles would be ruined; whereas no muscles are inserted into or near the head of the first metatarsal bone, therefore similar care is not needed thereabouts.

Dr. Dawbarn referred to the title *hallux valgus*, found in all our writings, as being an error; and though only one of nomenclature, worth correcting. There is no *hallux* in Latin, though there is a *hallex*, one meaning of which is *pollex pedis*. He had referred the point to Professor H. T. Peck, professor of Latin in Columbia University, who had confirmed this statement. Dr. F. J. Brockway, in his "Treatise on Anatomy," had therefore corrected the error; but as yet no other work on anatomy had noted it. The muscle which has been discussed would therefore be properly named *extensor proprius hallicis;* and the disease in question, *hallex valgus*.

Dr. L. S. Pilcher called attention to the operation suggested some years ago by his colleague, Dr. Fowler, which he had seen done with excellent results, and which he himself had practised with satisfaction. It was, he thought, the best method with which he was acquainted. The two great indications in the treatment of hallux valgus were (1) reduction of the subluxation; (2) division of the structures which tended to renew the subluxation. He quite agreed with Dr. Dawbarn as to the pathological condition present, and was inclined to believe that it was maintained mostly by contracture of the fibrous tissues upon the outer side of the metatarso-phalangeal articulation. Any operation performed should therefore include division of those shortened structures. That had been referred to by Dr. Weir when he spoke of the importance of dividing transversely the fibrous tissues upon the outer side of the second joint. The scar should be at such a point that the pressure of the shoe should bear as little upon it as possible. In Fowler's operation the commissure between the first and second toes was divided as far as necessary to expose freely the metatarso-phalangeal articulation; then the fibrous structures on the outside of the joint were divided transversely, and the phalanx dislocated to the inside so as to permit the head of the metatarsal bone to project in the wound, and receive such pruning with chisel or saw as seemed necessary in the particular case.

Dr. Pilcher had thought that there was in some cases an enlargement of the inner condyle of the metatarsal bone, and excellent results followed its retrenchment. But it was important to preserve the articulation, if possible, in order not to lose motion in the joint. It seemed to him that this division of the shortened fibrous structures in the commissure, so that the toe might not be canted outward was a highly reasonable procedure. He had also observed that the extensor tendon of the great toe was at times so shortened that it tended to reproduce dislocation. Hence in such cases it was necessary to divide it, and either leave it to the ordinary course of healing or suture it to such point as the surgeon might deem wise.

DR. WILLIAM T. BULL said he preferred a procedure simpler than the one suggested by Dr. Weir, for one which did not include any tendon suturing would probably accomplish as satisfactory a result. The plan which he had resorted to in about a dozen cases—speaking wholly from recollection—had been, he thought, practically that which Dr. Meyer had mentioned with one point excepted,—namely, that he had never interfered with the phalanx in any way. He made a longitudinal incision on the inner side of the foot, circumscribing the bunion or callus if such were present, then with a single blow on the chisel had removed the prominent articular surface of the metatarsal bone. He had followed a certain number of the cases subsequently, and the evidence was such as to satisfy him that the operation was a successful one; it required no particular ortho-pædic treatment afterwards, and in one or two instances in which there was still some disposition for the toe to incline outward there was no recurrence of the original trouble.

With reference to the operation of Dr. Fowler, it seemed to him that its favorable feature was the incision through which the operation was done. This was placed very advantageously so far as pressure effects went. One might say further that it would deal with the minor cases of displacement which constituted this deformity. As Dr. Pilcher had explained it it seemed to comprise almost all of the other operations. It did not seem to have anything very distinctive, for if there was anything wrong with the head of the bone, why, the head of the bone was simply removed. He asked Dr. Pilcher if his impression was correct, and Dr. Pilcher replied that it was. Dr. Bull added that the simple division of the contracted structures on the outer side of the joint would not constitute the proper remedy except in very mild cases.

Operations generally in which one counted upon union of tendons were somewhat uncertain. When sutured to periosteum they did not unite with the same readiness which other structures did, and he thought that in the attempt to do such suturing as Dr. Weir had described occasional failures might result. In looking at one or two of the photographs shown he would hardly suppose that the tendon was acting in a manner to prevent recurrence subsequent to the operation. He might add that he had seen one case, probably two, in which after such an operation the patient complained of inability to lift the toe. But this did not constitute a serious inconvenience in any way, and he did not believe that removal of the articular surface of the metatarsal bone, and even of a portion of the head would interfere with the firmness of the tread or support of the body.

DR. A. J. McCOSH thought Dr. Fowler's operation was exceedingly satisfactory. He was inclined to agree with Dr. Bull that it was not very difficult to get a good result in hallux valgus. In several cases, perhaps six or eight, he had done Fowler's operation on one foot, and the old-fashioned operation, referred to by Dr. Meyer and Dr. Bull, on the other, and so far as the final result was concerned, he had not been able to see much difference; it had been comparatively good in each toe. As he understood Dr. Fowler's operation, a part of the head of the metatarsal bone was always removed. He asked Dr. Pilcher if that was true. To this Dr. Pilcher replied that the special point of difference between Dr. Fowler's operation and others was in the location of the incision which was made in the commissure between the two toes.

DR. MEYER, thinking he might have been misunderstood, stated that in Riedel's operation the head of the metatarsal bone was never removed; it was always saved. The exostosis—for he thought it might be called an exostosis—was removed. The motion in the joint subsequently was good, though not perfect.

DR. WEIR rejoined that as to Fowler's operation, he thought it was a good one for ordinary cases, but in those which he had described it did not give satisfactory command of the outer aspect of the joint. Both it and the old operation often required a second opening to enable one to reach and dissect out the bursa which is necessary if it is in an inflamed condition. Regarding the outcome of his cases, having taken off as little of the head of the metatarsal bone as would answer the purpose, he had obtained results as to appearances and relief from the symptoms from which the patient had suffered, superior to those following any of the other operations he had done. He had seen no tendency to recurrence. After the ordinary operation, in which the sesamoid bones were left between the two toes, he thought their presence contributed not a little to the patient's subsequent discomfort, although the main source of the trouble, the bunion, had been removed. He had, however, particularly noticed that when the sesamoid bone was taken away, the inferior tendon generally slid into place. He did not therefore place so much stress upon transplanting the extensor tendon as he had at first done, but he still held to removal of the sesamoid bone, believing that it contributed a certain amount to the good result.

USE OF POTATO BOBBIN TO FACILITATE ENTERORRHAPHY; CARCINOMA OF THE SPLENIC FLEXURE OF THE COLON.

Dr. L. S. Pilcher presented a specimen of carcinoma of the splenic flexure of the colon removed recently from a woman, fifty-seven years of age. One point of interest was the fact that the tumor could have attained to such size, as large as the adult fist, without producing symptoms of obstruction. The woman had been cognizant of the presence of a tumor in her abdomen for several months, and had been failing in strength, but there had been no symptoms pointing to obstruction of the bowel, and it was not until after the abdomen had been opened and the location of the growth found to be within the bowel that its nature was appreciated. The growth was found to involve the entire circumference of the colon and to have destroyed by ulceration much of the substance of the colon at that point. It happened, however, that at the point which was involved the omentum had become wrapped about it and prevented perforation into the general peritoneal cavity. The mass, covered in by many adhesions, was detached by progressive tying and severing of all of its attachments, and finally the segment of diseased bowel, about five inches in length, was cut away after the technique ordinarily used in removal of segments of the colon.

In uniting the two ends of bowel he employed the method which had quite recently been described by Ullmann in the *Centralblatt für Chirurgie*, a modification of Maunsell's method of longitudinal incision of the proximal portion and inversion of the ends of both the distal and the proximal portion through it and suturing. The suggestion of Ullmann was that after these two approximated ends had been brought through the longitudinal incision a spool of raw vegetable—carrot he used, potato Dr. Pilcher used—should be inserted and the two ends tied about it with a single encircling thread of catgut or silk, and that then it should be replaced within the bowel. Being replaced, it carried with it the two ends brought into close apposition with a considerable surface, and the serous surfaces thus brought together would be held together as long as the core remained in place, or until the separation of that portion of intestine which was strangulated by the encircling cord, by which time firm union would have become insured.

The cases which Ullmann had reported had been unusually successful, and the experience of Dr. Pilcher in the case reported was that the procedure was an exceedingly satisfactory one. How long the raw potato would last he did not know. Carrot was used by Ullmann, but from other experience in the use of such vegetable materials for support of intestinal suture, the speaker believed, we had reason to think the potato would last long enough to secure the desired adhesion between the serous surfaces.

The operation was exceedingly well borne by his patient, and at its close there was nothing to indicate that anything more than a minor operation had been done. For ten days afterwards this good condition of the patient continued, her bowels moving satisfactorily and copiously for the first time on the seventh day. Early on the tenth day tetanic spasm of the pharyngeal constrictors were noted, followed later by generalized tetanus, which resulted fatally in forty hours, despite the early and large hypodermic use of the tetanus antitoxine.

TRANSACTIONS OF THE SECTION ON GENERAL SURGERY OF THE COLLEGE OF PHYSICIANS OF PHILADELPHIA.

Stated Meeting, December 11, 1896.

J. William White, M.D., President, in the Chair.

INGUINAL HERNIA IN EARLY INFANCY.

Dr. Randolph Faries reported a case of indirect inguinal hernia in a child two weeks old, in which strangulation had occurred, which was relieved by taxis under ether.

Dr. L. W. Steinbach said that some eight or nine years ago he had occasion to perform a double operation for inguinal hernia on an infant eighteen days old. It was due to phimosis.

DERMOID CYST OF ORBIT.

Dr. Thomas S. K. Morton presented a boy, aged eight years, from whose left orbit he had removed a dermoid cyst. The family had been previously free of any similar occurrence. When the boy was three years of age a swelling was noted above and just without the inner canthus of the left eye projecting through the upper eyelid. This was opened by a physician. Three years later it again reappeared. When he came under Dr. Morton's care, nearly five years after the first operation, the growth filled the inner portion of the orbit, and was just commencing to displace the eyeball outward, although its projection was entirely limited to a bulging of the upper lid. There was no discomfort complained of. Diagnosis, in absence of history of the contents found at the first operation, rested between dermoid cyst and meningocele. Upon making a careful dissection through an incision in the upper lid it was found that the growth was only adherent to the old incision, and at its extreme base to the inner wall of the orbit, one and a quarter inches below the level of the lid. It was pear-shaped (the stem being attached deeply as noted), about the size of a pigeon's egg, and entirely outside of the cone of ocular muscles. No important structure was injured in the excision. Owing to free bleeding and the depth of the wound, it was impossible to carefully inspect the point of attachment to bone or to be sure that the pedicle did not perforate into the brain cavity or a sinus.

Interrupted sutures were introduced without drainage, and a pressure dressing applied for a few hours. Primary union of the wound was secured. At the time of exhibition only a half-inch scar upon the upper lid towards the inner canthus running obliquely from above downward and outward was observable.

The growth upon section proved to be a dermoid cyst. Its wall, inside and out, was fibrous, except a portion of the inner lining, one-half inch by one-fourth inch in area, which was composed of true skin containing sebaceous and hair glands. The contents of the cyst were two drachms of thick sebaceous material and a group of hairs springing from the patch of skin.

Dr. Edward Jackson said that this dermoid cyst was apparently larger and somewhat more deeply situated than most of those that are encountered about the orbit. The largest he had seen was probably about the same size, but was situated at the outer angle of the orbit, a less usual position for them. It also was outside of the cone of muscles. They sometimes extend so deeply that removal is impossible. Within a few months one has been reported in the *Ophthalmic Review* by Mr. Doyne, of Oxford, England, where, though assisted by other experienced surgeons, he was compelled to stop short of complete removal. They followed the cyst back as far as they felt they safely could go, beyond the limits of the normal orbit, and then stopped with an incomplete operation. At the last meeting of the American Ophthalmological Society the matter was under discussion, and two or three members had resorted with great satisfaction to using something within the sac. Dr. Buller, of Montreal, placed crystals of silver nitrate in the sac, and said that he would prefer that to any other treatment, the cases in which he had tried it had done so nicely. Dr. Standish, of Boston, had, after emptying the sac, swabbed it with cotton dipped in tincture of iodine, and secured complete obliteration. Dr. Jackson thought that extirpation was the best treatment if it could be done, but some cases are encountered where it cannot be done, and here caustics may be of special value.

CHARCOT'S DISEASE OF THE KNEE.

Dr. Max J. Stern presented for Dr. John B. Roberts a photograph and a skiagraph of a case of Charcot's disease of the knee.

Dr. T. G. Morton presented from the Pennsylvania Hospital a man, forty-nine years of age, with the same malady, whose history was as follows: His first symptoms commenced three years before in the right limb, the left limb became secondarily affected only four months ago. The knee-jerks are absent, and there is occasional involuntary passage of urine, occasionally the same with bowel movements in his clothes. He has irregular pupils and all the symptoms of tabes. The right knee is very much enlarged, due to a great deal of effusion and to arthritic changes. The patella is drawn over to the right; there is a posterior dislocation of the leg or anterior of the femur; the other leg is gradually following. Twenty-six years ago he had a chancre; it healed up in nine days; apparently was perfectly well after that. He is subject to lightning pains down both limbs.

Dr. J. M. Da Costa said he had examined this man at the invitation of Dr. Morton. He had an Argyll-Robertson pupil, which was very confirmatory of the diagnosis. Two years ago he had the sharp lancinating pains of the kind common in locomotor ataxia. There was inco-ordination of gait. On the plantar surfaces of the feet distinct anæsthesia was found. One of the knees is very much affected, and the other is not. As a rule, this is a symmetrical disease, and the joints are similarly affected. In this patient there is a marked difference between the two knees; the deformity is distinct on one side, and there is little on the other. With reference to the absent knee-jerks, usually conclusive signs, it is important to bear in mind that they are absent here on what is comparatively the sound side. If they were absent on the diseased side it would not be to Dr. Da Costa's mind so significant a feature. He has noticed in various affections around the joint with swelling that no knee-jerk is found, and he would not have laid much stress on the absence of knee-jerk here were it not for the fact that on the side that is but little involved the knee-jerk is just as completely absent as it is on the markedly deformed side. It is further of some interest to notice in connection with this case that the knee symptoms were comparatively permanent and came on at an early stage of the disease; at least they attracted the patient's attention when the other symptoms were not pronounced. He thought that it would not be right to call the case one of Charcot's disease, for this is a term applied to disseminated or insular sclerosis, and has nothing to do with Charcot's knee- or joint-disease, the arthropathy of locomotor ataxia or tabes.

Dr. T. G. Morton said, in the way of treatment, he would propose that both legs be supported by appropriate braces connected with a spinal support. He thinks that is all that it is possible to be done for the patient under discussion. The last case Dr. Morton saw of this sort he declined to operate. The patient wanted an amputation, and was taken to a hospital in the city and the limb was removed, and three days afterwards the patient was no more. That is just what he supposed would happen. The only thing is to support the limbs so as to have one knee fixed straight, the right one, and to allow partial flexion of left.

Dr. White said that it would be interesting to determine whether or not there is any reason why the operation should be necessarily severe, or almost certainly fatal in such cases. We operate in other spinal cases with a fair amount of success. He could see why any attempt at conservative surgery in such joints would be likely to meet with failure, but in cases where the disorganization is still more complete, and where possible removal of a portion of the limb might add greatly to the comfort of the patient, it is difficult to explain on general principles why we must expect to lose a very large percentage of cases if the general health (as in this instance) is not affected.

Dr. White stated that he had declined operation in the few opportunities he has had, but it seems worth while to think whether there are figures enough to justify our basing it on clinical experience or whether there are theoretical reasons which ought to prevent us from interference or both.

Dr. W. W. Keen said he was inclined almost never to interfere. At the Orthopædic Hospital, not long ago, he put on a brace and advised no other treatment.

Dr. T. G. Morton said the patient he referred to in which death followed operation was a fairly vigorous man. He belonged to the Fire Department of this city. Dr. Morton advised against operation because the fact that the man dying he would encumber the Fire Department with a pension for the widow. He did die and his family made a claim for pension, and it was declined on account of the nature of his malady and because it was not an injury obtained in the service. He weighed from 180 to 190 pounds.

PANCREATIC CYST.

Dr. Charles B. Penrose reported a case of cyst of the pancreas occurring in a woman, aged thirty-three years, who had always been in good health until two years before admission to the Gynécéan Hospital, May 29, 1896. At this time she first noticed a lump in the upper portion of the left side of the abdomen. This seemed to disappear for a time, and then return, and has since been gradually increasing in size. On admission, the patient complained of backache; of attacks of faintness; painful urination; slight loss of flesh. There was no abdominal pain. The only discomfort being due to the size of the tumor. There was no headache; she slept well; appetite and digestion were good; bowels were regular.

The patient presented a large, round, smooth, cystic tumor of the abdomen. Though no pelvic attachment of the tumor could be determined, it was thought that the growth was probably a unilocular ovarian cyst. Cœliotomy was performed on June 2, 1896. A unilocular pancreatic cyst, containing two and a half gallons of brown fluid, was discovered. The character of the growth was very quickly recognized, and no attempt was made to remove it. An incision about two inches in length was made in the anterior wall of the cyst; the contents were evacuated, and the opening in the cyst was sutured to the upper angle of the abdominal incision. The remainder of the abdominal incision was closed with interrupted sutures. It was observed that large, venous channels traversed the cyst wall. Two of these channels were opened by the incision made to empty the cyst. The bleeding from them was very free, but was readily controlled by the sutures, which attached the cyst wall to the abdominal incision. The fluid removed from the cyst was subsequently examined, and pronounced by the pathologist to be pancreatic fluid. For several days following the operation there was a very free discharge of bloody serum and pancreatic fluid from the interior of the cyst. The quantity of this fluid gradually diminished until her discharge from the hospital on July 1, 1896. At this time but a few layers of gauze were saturated with the fluid during the twenty-four hours. From the time of the operation until her discharge she had a continuous elevation of temperature. Notwithstanding this fact, her general condition seemed to be good. She suffered no pain. Appetite and digestion were normal and bowels regular.

She left the hospital at her own request, though her temperature at that time was elevated. Her physician, Dr. P. S. Downs, of Dover, wrote in November, 1896, that she had steadily improved during the summer, and that then the incision had closed, her general health was good, and she had returned to household work.

Dr. W. W. Keen reported an additional case of a similar nature in the person of a girl, fifteen years of age, who had been sent to him on October 14, 1896, by Dr. Carlton, of Athens, Ga. The patient then weighed 126 pounds. Three years before she had weighed 135 pounds. She had never suffered from malaria. She had never had any injury to the abdomen. Four years before, while bathing, she noticed the presence of a swelling in the left upper abdomen. The bulk of the tumor was such as to cause some dyspepsia and she could not eat a hearty meal on account of the oppression caused by it. Soon after this the swelling became the seat of occasional very severe attacks of pain which would last for ten to twenty minutes, and were severe enough to cause her to scream. A year ago she was sick abed for between four and five months on account of this pain, which then was continuous. She could not lie down, but was obliged to recline in the bed. She thinks that during that illness the abdomen enlarged quite rapidly, but since then no serious change has taken place. Early in 1896, at the end of this illness, dresses which she could wear with comfort when the illness began would not meet by four or five inches.

When first seen by Dr. Keen she was a well-nourished girl, not anæmic, bright and cheerful, and not in any way alarmed or anxious in view of an operation. The entire left side of the abdomen was filled with a large, hard, apparently solid tumor, the lower limit of which is two inches below the level of the umbilicus; the right border extends four inches to the right of the umbilicus. The upper border is lost in the hepatic and cardiac dulness. The abdominal wall is too tense to allow the insertion of fingers under the inferior or the right edge of the tumor. The whole mass is dull on percussion. In the left flank, and apparently separating the tumor from the kidney, there is distinct resonance from the colon. There is no fluid in the abdomen. The umbilicus is an elastic, deep, sensitive cup. This sensitiveness seems to have existed prior to any knowledge of the tumor. There is no œdema of the legs; the heart and lungs are normal. Vaginal examination, easily made, shows a normal virgin uterus and ovaries and no apparent connection of the tumor with them. She has never had any fatty stools, nor have any been observed since she entered the hospital. Percussion elicits an obscure fluctuation. The splenic dulness could not be differentiated from that of the tumor.

Examination of the blood at 8 A.M.: red corpuscles, per cubic millimetre, total, 3,200,000, of which all were practically normal, an occasional one being slightly crenated. Total number of white corpuscles, per cubic millimetre, largely increased,—about 200,000. Hæmoglobin, 65 per cent. of normal. While the total number of red corpuscles was somewhat diminished, yet it must be remembered that the patient had taken no food for some ten or twelve hours. While the white corpuscles were increased, they showed no alteration as to structure. Slides of the undiluted blood were examined especially for evidence of malaria, giving entirely negative results.

Urinary Examination.—Total quantity passed, twenty and one-half fluidounces; color, pale straw; sediment, mucinous, easily diffused; reaction, acid; specific gravity, 1.030; urea, 3 per cent.; total output, 309 grammes; serum albumen, none; serum globulin, none; sugar, none.

Microscopic Examination.—Uric acid crystals and very few calcium oxalate crystals. Squamous epithelial cells, probably from the bladder, were present; they were slightly granular, but the nucleus is not affected, nor were they water-soaked.

The abdomen was opened October 17, 1896, by a vertical incision at the outer border of the left rectus, which was extended from the border of the rib down to about an inch below the umbilicus As soon as the peritoneum was opened it was apparent that the tumor was a very tense cyst, on the front of which the stomach was spread out and so intimately adherent that on attempting to separate it from the cyst wall the muscular coat of the stomach began to tear. The cavity of the stomach was not opened. The tear was secured by three stitches.

The omentum lay in front of the cyst and the descending colon to the left side and behind it. It had no connection with the uterus or ovary. The mass was, therefore, evidently retroperitoneal, probably a cyst of the pancreas. In order to reach and open the cyst to the left of and below the stomach it was necessary to make a transverse incision from the middle of the vertical one. When the muscular wall had been divided down to the transversalis fascia, it was found that the remaining belly wall could be stretched outward sufficiently into the lumbar region. The peritoneum below and to the outside of the stomach was then torn through and the cyst wall incised. This gave exit to an amount of fluid which, from subsequent measure and estimate of the loss, was about seven pints. The fluid had absolutely no odor. At first it was a straw-colored fluid, very much like that of a hydrocele; later it became a thin, chocolate-colored fluid, like chocolate made with water rather than with milk. The fluid was under such pressure that on making the small opening it spurted in a steady stream four or five feet from the table. When the cyst was evacuated, the finger passed in reached downward into the left iliac fossa, but there was no evidence of any connection with the ovary or other pelvic viscus. Upward the diaphragm could be touched, posteriorly the kidney could be distinctly outlined, apparently lying posterior to the sac. Towards the right side the cyst extended much farther than the fingers could reach, but a long pair of pedicle forceps passed over to the right side just below the liver and the border of the ribs. The vertebræ were perceptible through the posterior wall. The pancreas could not be recognized; no perceptible communication existed with the pancreas, nor could any calculus of the pancreas be felt.

A culture was made from the fluid, and also a quantity of it given to Dr. Kyle with the request to examine, first, for urea; secondly, for bile; thirdly, for evidence of its being pancreatic fluid. The divided abdominal muscles were now united by catgut and the whole incision closed by silkworm gut excepting where the mouth of the cyst was fastened into the incision. The intimate adhesions of the cyst with all the other viscera caused the idea of dissecting it out not to be considered for a moment. The mouth of the sac was packed with a little iodoform gauze, and an ample dressing was applied on the wall of the abdomen. The patient stood the operation very well.

After the operation her temperature once rose above 101° F., but reached the normal by the second day. Three days after the operation the gauze drain was removed, and the cavity was drained thereafter, sometimes by a drainage-tube, sometimes by gauze, as the one or the other was found to answer best. After two weeks all drains were withdrawn, and for a few days the mouth of the sac was simply kept open by passing a pair of hæmostatic forceps into it once a day. The tract closed definitely four weeks after the operation. Her weight is now 123 pounds, which is a gain of four pounds since the operation, making allowance for the loss of weight from the fluid removed. Her menstruation returned three days after the operation.

As to the fluid removed from the cyst at the operation, a bacteriological examination showed it to be sterile. The cyst fluid itself showed a neutral reaction; specific gravity, 1.017; urea, 0.4 per cent.; serum albumen and serum globulin were both present in an amount almost sufficient to set in the tube when coagulated by heat. Tests for bile and mucus gave negative result. No cholesterin was present. By the iodine test a starch ferment was found, yet repeated tests showed no effect on fat. The microscopic examination showed coagulated fibrin both in lines and meshes, the latter enclosing leucocytes, which were also scattered singly throughout the field. They were swollen from fluid absorbed, were granular and undergoing fatty metamorphosis. Crenated blood-cells were present, but were not water-soaked and were possibly from the cut surfaces.

The fluid collected later was examined by Professor Brubaker, who reported "that starch was rapidly transformed into sugar, which was capable of reducing Fehling's solution of copper. Neutral fat was after a short time emulsified, though the emulsion was imperfect as compared with that produced by artificial pancreatic extracts; on proteids, the action, if any, was so slight that it is difficult to make any positive statements regarding it."

The reporter was not able to assert any probable cause for the occurrence of this cyst. No stone was found; there seems to have been no reason to suspect an obstruction of the duct by stricture or pressure, nor had there been any injury to account for it.

The consistency of the tumor was such that at first the reporter was disposed to think it a solid tumor. Richardson ("Dennis's Surgery," Vol. IV) has observed this great tension of the cyst and the natural error in diagnosis that may result from it. The absence of anæmia or other conditions pointing to the spleen, the absence of a distinctly palpable edge to the tumor below and to the right convinced him that it was not the spleen. When, on a second examination, he became convinced of its cystic character, a fact which would easily have escaped notice had not the greatest care been taken to determine the obscure fluctuation, the diagnosis lay between a hydronephrosis, a pancreatic cyst, and possibly, though not likely, a cyst originating in either the gall-bladder or the ovary. The position so far to the left and above, and the fixity, as well as the physical examination, including a vaginal examination, which was quite easily made in her case, was distinctly against its being ovarian or hepatic in origin. He was chiefly in doubt as to whether it was a hydronephrosis, or possibly a retroperitoneal cyst, probably of pancreatic origin. The entire absence of all renal symptoms, the normal condition of the urine, the absence of any "flush-tank" symptom, the presence of the colon behind the tumor, all seemed against a renal origin. On the other hand, there being no marked loss of weight, no fatty stools, and the very left-sided position of the tumor raised a doubt as to whether it were pancreatic.

The examinations of the cyst fluid obtained at the time of operation and of that obtained later was of interest, especially the fact that the fluid obtained at the time of operation did not emulsify fats, and also that it contained a moderate amount of urea. Undoubtedly the non-emulsifying of the fat was due to an alteration in the character of the fluid from its being retained so long. It is to be regretted that a more thorough examination of the later fluid was not made at the time, but when these facts were reported later the opportunity had then passed. The later fluid which flowed out in moderate quantities did emulsify fats and act upon starch, as was determined by Dr. Brubaker, showing, therefore, its undoubted pancreatic character. In addition to this, the later production of slight pancreatic diabetes points to the same conclusion as to its nature. Had he depended for diagnosis on tapping and an examination of the fluid, the presence of urea might easily have led one into the error of supposing the tumor to be due to a hydronephrosis.

Urea is found occasionally in simple cysts of long continuance, also in ascitic fluid, and is sometimes found in pancreatic juice in jaundice (Landois and Stirling, "Physiology," 3d edition, Philadelphia, p. 299). The source of it is probably a slow tissue metabolism, or possibly from the destruction of the blood-corpuscles (Hamilton's "Pathology," Vol. II, Part I, p. 186), which in the liver produces urea, and probably in other parts of the body may do the same. The percentage was about the same as that found in the fluid of hydronephrosis, but the character of the fluid, both at the time of the operation and later, was wholly different from that of a hydronephrosis, and resembled the pancreatic fluid, except that instead of being colorless it was quite yellowish. It was also moderately viscid. Bull (*New York Medical Journal*, October 1, 1887) found "traces" of urea in a similar cyst, and Sutton ("Tumors," p. 426) also refers to its presence in small quantities.

The reporter purposely refrained from aspirating the tumor, for the reason that in such cases, especially in tense cysts, he regards aspiration as a dangerous procedure; far more so than an incision, and at the same time it is far less likely to give the information desired. The operation showed that had an aspirating needle been inserted at the point of greatest prominence and greatest tension, it would have gone directly through both walls of the stomach, which was spread out like a fan over the tumor. In addition to this, as is so frequently the case, the tension under which the fluid existed in the cyst was such that even had a small aspirating needle been used, the fluid would have been forced out into the belly cavity. Though ordinarily sterile, the fluid of these pancreatic cysts is not at all uniformly so, and if not sterile its escape may easily result in a fatal peritonitis. In the present case the fluid happily was sterile.

As to the incision in the belly wall, the method adopted in gaining access to the tumor he was well satisfied with. It greatly facilitated access to the left side of the tumor quite well back towards the loin. When the operation was over the divided muscles were sutured, and the integrity of the abdominal wall is apparently very much better re-established than if it had been divided through its whole thickness.

Only two methods of treatment can be considered in connection with such cysts. First, incision and drainage; secondly, enucleation. The latter was wholly impossible in this case. It is not commonly possible to excise. Zweifel (*Centralblatt für Gynäkologie*, 1894, p. 641) states that extirpation has been done twelve times with five deaths; three from septic peritonitis, one from hæmorrhage, and one from pericarditis four weeks after the operation. Of thirty-one cases in which incision and drainage have been done, only two died; but of the twenty-nine who recovered ten suffered from a more or less permanent fistula. The ultimate influence of such fistulæ in the production either of diabetes or of loss of weight and health from defective nutrition, especially from the non-absorption of fats, has not, so far as the reporter knew, been followed out in any number of cases.

Dr. White said he believed it to be a fact that in pancreatic cysts generally the cause has remained unknown even after there have been opportunities for autopsies. Complete obstruction of the duct, which is what one might imagine to be the most common cause, either from calculus or otherwise, seems to produce atrophy of the gland rather than a tumor. Dr. Keen's case is no exception. The preoperative diagnosis in most of the cases that he knows of, and in the first case that Dr. White had seen, had not been correct. This case Dr. White saw with Dr. Agnew at a time when he did a good deal of abdominal work; the diagnosis was that of an ovarian cyst, and he remembers very well the incision having been made, the wall of the cyst exposed, and Dr. Agnew having the trocar about to insert, when he took a second look, laid it down, and called Dr. White's attention to the fact that the stomach was, as in Dr. Keen's case, stretched tightly over the wall of the cyst; another second and he would probably have gone through the walls of the stomach. In those days that would have been more serious than in these days. Dr. White thought Dr. Keen's plan for avoiding the stomach was very ingenious and instructive. The only question of treatment which occurred to Dr. White in regard to Dr. Keen's remarks was as to the propriety of operating in one or two stages. We must choose between incision and drainage and excision. Dr. White thinks scarcely any surgeon would have advocated excision. Excision has a mortality of over 30 per cent. Pancreatic cysts may be treated either by immediate incision and drainage or by bringing the walls of the cyst to the belly wall, suturing, waiting for adhesion, and then opening. Dr. White thinks, however, in the case of a cyst under such tension as Dr. Keen describes, that even the introduction of sutures would be followed by more or less leakage, and very little would be gained by delay. It involves that risk at any rate where the cyst is very tense.

Dr. Randolph Faries concurred with Dr. Keen in the differential diagnosis. Last spring he reported a case of sarcoma of the kidney in a child. The position of the tumor was such that it occupied the whole of the abdominal cavity. The colon passed over the hilum, which apparently gave two tumors, there being marked resonance directly over the colon. Until he had had a consultation, he was misled by examination of the urine, which was perfectly normal. From this Dr. Faries at first thought of pancreatic cyst or some hepatic trouble; but later thought it might be sarcoma of the kidney. He was able afterwards to make a post mortem. It was absolutely impossible to tell from the urine or by the position of the large sarcoma that it was a sarcoma, and especially since it gave resonance over the colon. This might have been a possible condition in Dr. Keen's case of pancreatic cyst.

EDITORIAL ARTICLES.

SCHLATTER ON THE TREATMENT OF TRAUMATIC INJURIES OF THE LIVER.[1]

In most modern text-books of surgery but little space is devoted to injuries of the liver, and even in cases where the injury to the parenchyma of the organ is comparatively slight the prognosis is regarded as very grave. Thus is perpetuated the old idea that injuries involving the liver are necessarily fatal. Fortunately, a review of recent literature reveals the fact that here as elsewhere modern surgery has done much to lessen the gravity of the prognosis.

As has been shown by Mayer,[2] all surgeons up to the beginning of the present century united in regarding injuries of the liver as practically hopeless. The famous surgeon of the Napoleonic wars, Larrey,[3] writing in 1812, says, "Laceration of the liver will always prove fatal if the wound communicates with the abdominal cavity;" in another place he states, "The escape of bile into the abdominal cavity is fatal." As late as 1864, Pirogoff[4] asserted that wounds of the liver were more frequent than of the stomach or spleen, and, in his experience, were always complicated and fatal. At the present time, however, it is a satisfaction to know that this region no longer is characterized by the phrase *noli me tangere*, and that the surgeon familiar with modern technique may act energetically in the face of apparently fatal injuries.

Few cases are recorded in comparison with the injuries which actually occur. The most complete statistics are those of Edler, in

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[1] Beiträge zur klinischen Chirurgie, Bd. xv, Heft II, Tübingen, 1896.

[2] Die Wunden der Leber und Gallenblase, Munich, 1872.

[3] Memoiren der Militärchirurgie, 1812.

[4] Kriegschirurgie, 1864, p. 576.

1887, of 543 cases, including those of Mayer (267) and of Nussbaum, 1880 (251). This is easily accounted for, since many persons so injured die before medical assistance is ever obtained, and in other cases the prognosis is so hopeless from the time of injury that there is little inducement for publication.

The prognosis has materially changed within the past decade. Formerly, physicians based their views almost entirely upon their personal experience. Nowadays medical literature is so extensive that a much wider field can be covered in the formation of an opinion. The mortality shown by the statistics of Edler is 66.8 per cent.; in ruptures, 85.7 per cent.; in gunshot wounds, 55 per cent.; in incised wounds, 64.6 per cent. Since these reported cases are only those of more than ordinary interest, or those in which the prognosis was especially favorable, these figures show a better condition of things than really exists.

A small minority of patients recover, and sometimes do so without external interference, for it occasionally happens that, at an autopsy, there is found an old and healed scar in the parenchyma of the liver. This fact is alluded to by Nussbaum, who adds that "it should strengthen our hope that in a few cases something can really be done."

As early as 1795 Theden[1] states that "the primary danger in wounds of the liver lies in the hemorrhage that occurs, and this danger is increased if any large bile-ducts are opened. As both blood-vessels and bile-ducts are larger on the under surface of the organ than elsewhere, wounds in this region are more dangerous than those of the convexity." These views correspond practically with those of the present day. Were it not for the complications of loss of blood primarily, and secondarily cholæmia, wounds of the liver would not be dangerous in themselves. It is now known that the escape of bile into the peritoneal cavity is not of necessity a source of danger. The mechanical irritation caused by its presence may give rise to a serous exudate, but bile is markedly antiseptic in its nature, and many cases have been reported in which bile remained free in the abdominal cavity for days or even weeks without giving rise to peritonitis.

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[1] Mayer, p. 114.

The task, then, which the surgeon is called upon to perform in cases of traumatic injuries of the liver is to check the hæmorrhage as soon as possible, and to prevent the retention of bile in the peritoneal cavity on account of its liability to cause cholæmia. Various methods have been used to produce this desired result. Rest was, of course, the method earliest employed. Later came the era of antiphlogistic treatment with the accompanying vesication and venesection, and to-day one wonders at logic which could support such remedies. Of direct applications compression by means of tamponnade was the simplest, most primitive, and quickest method used. Then came the thermo-cautery, and, within recent times, direct suture of the wound as in other parts of the body.

It is to this latter method that Dr. Schlatter especially directs his attention.

The literature on the subject is not very extensive. Postempski, in 1892, reported five cases in which recovery occurred after the wound in the liver had been sutured. Operations by Adler,[2] Smits,[3] and von Eiselberg[4] gave good results with this method. Burkhardt,[5] however, regarded the method of suture as available only in those cases where the wound is a superficial one; if too deep to be included in the track of the needle he advocates the use of iodoform-gauze tampons, so arranged that fibrinous exudate after a few days would form a canal leading to the surface of the abdomen for the escape of bile and wound discharge. Langenbuch[6] performed the operation of fixation of a "wandering liver" by passing a row of sutures through the entire thickness of the right lobe and then fasten-

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[1] Centralblatt für Chirurgie, 1893.

[2] Deutsche medicinische Wochenschrift, 1892, No. 2.

[3] Centralblatt für Chirurgie, 1893, p. 622.

[4] Wiener klinische Wochenschrift, 1893, No. 1.

[5] Centralblatt für Chirurgie, 1887, p. 88.

[6] Centralblatt für Chirurgie, 1891, p. 82.

ing them to the costal cartilages. Adler[1] reported a case of stab-wound of the liver where, in spite of the use of sutures, hæmorrhage still continued, and tamponnade was finally necessary. Hochenegg, after the removal of a tumor from the liver, preferred to treat the wound extraperitoneally, and supported the upper and lower edges of the wound by sausage-shaped rolls of iodoform gauze, held in place by deep mattress sutures. Von Bergmann[2] removed an adenoma of the liver and checked the bleeding by drawing the wound together with silk sutures and tying them over strips of iodoform gauze placed along the wound. The sutures were left in place some days, and finally carefully removed. Korte[3] had a case in which a gunshot wound of the liver was cured by iodoform-gauze tamponnade of the wound. Other writers cited are divided in their preference between the thermo-cautery and the tamponnade with iodoform gauze.

Dr. Schlatter adds to these cases five more of his own. A summary of these is as follows:

(1) Stab-wound of the liver; prolapse of the colon and omentum; profuse hæmorrhage from the liver; wound about one inch wide and so deep that the finger-tip failed to reach the bottom; two deep sutures of heavy catgut and two capsular sutures of fine silk; recovery.

(2) Gunshot (revolver) wound of the liver; severe hæmorrhage; three deep sutures of heavy catgut checked the bleeding and a good recovery was made.

(3) Gunshot wound of the liver by Flobert projectile. The track of the bullet involved the stomach, the jejunum, the pancreas, and the left kidney. Patient seventeen years old and liver tissue was friable. Six deep silk sutures stopped hæmorrhage; death after eight hours.

(4) Rupture of the liver and right kidney two days before operation; extreme anæmia; laparotomy; suture of liver; hæmorrhage stopped; saline infusion; death.

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[1] Deutsche medicinische Wochenschrift, 1892, No. 2.

[2] Centralblatt für Chirurgie, 1893, No. 30.

[3] Sammlung klinische Vorträge, No. 40.

(5) Almost complete sagittal rupture of the left lobe of liver. Profuse exudate of bile into peritoneal cavity; laparotomy and suture of the liver fourteen days after the injury; death.

In only one of these cases (3) was there a tendency for the sutures to cut through the tissues. In this case silk instead of catgut was used, and the tissues were more friable than in the other patients, who were all adults. The results, so far as the checking of the hæmorrhage from the wounded liver was concerned, must be regarded as satisfactory. The combination of deep catgut sutures of large size with fine silk superficial sutures of the capsule is recommended, and will be used by the writer in the future. In view of the success attending the first of these cases the objection of Burkhardt to the use of sutures in any other than superficial wounds does not appear to be valid.

The fact that it is possible to completely close the abdominal cavity after the use of sutures in wounds of the liver adds materially to the clinical value of the procedure.

That large bleeding vessels in the parenchyma of the liver may be ligated directly has been shown by Clementi's[1] experiments upon animals, and by Smits's and von Bergmann's operations.[2]

Where the wound is a large one, as after the removal of a tumor, the combination of sutures, mattrass sutures, and tamponnade may be necessary; but as a rule the tampon should be used only in cases where sutures have failed to check the hæmorrhage. Of the three methods the thermo-cautery is of least value. It will check only moderate parenchymatous hæmorrhage, is of no value in extensive wounds, and is apt to be followed by secondary hæmorrhage.

Another important question remains to be considered in this connection. However summarily the surgeon may act in gunshot or stab-wounds of the liver, there remains a class of cases in which the diagnosis is often very difficult, and the proper course to pursue is uncertain. These are the cases of subcutaneous rupture. Of course, if, after a severe injury to the abdomen, in the region of the liver, there gradually develop the symptoms of internal hæmorrhage, if the pulse becomes more rapid and small, if the patient grows more and more anæmic, if the area of liver dulness on percussion is increased, if pain, referred to the scapular region, develops, or icterus begins to appear, the diagnosis is easy. Unfortunately for physicians, cases where the symptoms are so well marked are very rare. Such violence as is caused by the kick of a horse does not by any means always result in an internal lesion. Fatal cases have been reported of this character where the autopsy revealed an acute peritonitis and no other internal injury. On the other hand, slight accidents may give severe results; for example, the mere fall upon the ice.[1] The cause of rupture of the liver may be an indirect one, as is shown strikingly in a case reported by Rezek,[2] where the victim fell a short distance, striking upon the feet; death was shown to have been caused by a rupture of the liver and of the great vessels at its base. Aside from the size of the organ, the slight elasticity of its tissue, its method of attachment, and its weight are important factors in the occurrence of rupture.

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[1] Centralblatt für Chirurgie, 1892, p. 84.

[2] Op. cit.

The symptoms of internal hæmorrhage may also easily be confounded with those of shock arising from slight contusions of the abdomen. Changes in the heart or in the brain will give a similar clinical picture to the one produced by bleeding; thready or absent pulse, deathly pallor, superficial and irregular breathing, and marked mental depression with restlessness. A differential diagnosis in such cases may be impossible, and time only will show the actual condition.

To diagnostic uncertainty must be added the other considerations, which add to the surgeon's perplexity. Certain cases of ruptured liver have gone on to a spontaneous recovery, without surgical intervention. Even if an operation be performed, the occurrence of liver-cell emboli may set at naught the best efforts, and the more severe and extensive the laceration the more apt is such a misfortune to occur. In view of these facts would it not be better for the surgeon to sit idly by and allow the patient to await his fate?

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[1] Meyer, p. 165, Case 86.

[2] Edler, p. 346.

To this important question most operators will answer, "No," and maintain that it is the duty of the surgeon in such cases to adopt the course that offers the greatest number of chances of success to the patient. If an operation be performed and a slight injury found, there is, of course, a very slight possibility that spontaneous recovery could have taken place. On the other hand, if the liver is found almost pulpefied by the severity of the trauma the patient would die in any case. Between these two extremes lie a great number of cases of varying severity. The decision must be given in favor of an exploratory laparotomy. If occasionally such an operation is performed with no discoverable necessity, the surgeon can, at the present time, easily justify the procedure as being on the side of safety; how much more severe will be the censure if he has failed to realize the gravity of the case, and has either operated too late or not at all.

The time of operation is to be determined by the fact that the sooner it is performed the more apt it is to be successful. For the surgeon the only question of doubt is regarding a possible unnecessary operation. With the practising physician the decision is much easier. If there is the slightest indication that there may be a rupture of the liver, the decision of a surgeon should be at once obtained in order that no valuable time may be lost. The diagnosis will often be cleared up in the mean time, and an operation may be performed with the least possible delay.

The only remaining question to be considered is the one, What portion of the abdominal wall offers the best site for the operative incision? The upper portion of the liver, hemmed in as it is by the costal framework and by the diaphragm, is in a bad position for surgical access. The left lobe and the irregular and concave undersurface is, on the contrary, most accessible. By moderate traction the anterior portion of the convexity can usually be brought within reach, and in a similar manner even the almost inaccessible posterior parts can occasionally be operated upon. In one case reported above (Case 4), Schlatter was thus able to suture the lobus spigelii. Division of any of the ligaments of the liver, with the possible exception of the suspensory ligament, which is of little or no hinderance to an operation, is scarcely to be contemplated. The use of tension will therefore be of but little assistance in moving the organ to any given site of operation.

In penetrating wounds the existing wound can be enlarged and converted as far as possible into the incisions about to be described. If the site of injury is in the left lobe, or is undetermined, a median incision should be made ; in wounds of the right lobe a curved incision along the lower border of the costal cartilages and to the right of the rectus muscle is to be preferred. In some cases these may be combined, thus forming an angular incision. Since by far the greater number of wounds of the liver are located on the ventral or lateral aspects of the viscus, these two plans of attack will nearly always suffice. Wounds situated posteriorly, the lumbar incision is hardly to be recommended on account of the thickness of the muscular walls, and the fact should be borne in mind that, as reported by Lannelongue, the thoracic wall can be resected along the anterior portions of the eighth, ninth, tenth, and eleventh costal cartilages, for the pleura does not extend down to this part of the chest wall. The method of Lannelongue consists in an incision parallel with the thoracic border, and two centimetres above the same, beginning three centimetres from the border of the sternum, and ending at the junction of the tenth rib with its costal cartilage. The retraction of the divided muscles exposes the costal cartilages to be resected, they are carefully freed from their attachments and cut through with cartilage scissors. Then, if the ends of the ribs are retracted and pressed apart, nearly the entire extent of the convexity of the liver can be made accessible.

It seems probable that if these practical suggestions of Dr.

Schlatter are adopted as a basis of treatment not merely by surgeons, but by the practising physician as well, the prognosis in injuries of the liver will in the future be much more favorable.

H. P. de Forest.

BRUNS ON THE EVOLUTION OF THE MODERN TREATMENT OF GOITRE.[1]

Two decades ago the only treatment in vogue for goitre was the old and untrustworthy remedy iodine. At the Sixth Congress of German Surgeons, in the year 1877, attention was called by Rose, based on his own experience, to the radical cure of goitre by extirpation. This communication was particularly timely as the beginning of the antiseptic era prepared the ground for the greatest surgical undertakings. It is interesting to note how rapidly the excision of the thyroid and improved results followed. In twenty-seven years prior to 1877 only 150 excisions of the thyroid had been recorded, with a mortality of 21 per cent.; while in the five years following 1877 there were 240 operations, with 12 per cent. mortality.

Operations for extirpation of the thyroid lost their greatest drawbacks and dangers,—secondary hæmorrhage and wound infection,—not only with the development of antiseptic measures, but also with the perfection of methods and technique of operation.

Prior to this time the operation had been conducted like in ordinary extirpations of a tumor, the goitre being superficially isolated and all blood-vessels ligated as cut, the result being that the same vessel was often divided in different places and required repeated ligation.

The separation of the cellular tissue was often pursued too far, resulting in extensive bleeding, requiring ligatures *en masse,* obscuring the entire operative field, and jeopardizing the nerve-trunks. This uncertain method of atypical tumor extirpation was now transformed into the typical extirpation of a viscus, an absolutely safe operation, and for the experienced operator a bloodless and complete procedure. The credit of devising a systematic operation belongs, above all, to Billroth, and next to Kocher, who essentially perfected it. It depends on the certain principle of exact anatomical knowledge concerning the course of the arteries and veins of the thyroid, and of the recurrent nerve, so that the essential object of the operation is the typical exposure and isolated ligation of the main arteries and veins at their well-known situations, and the speedy and bloodless isolation of the tumor.

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[1] P. Bruns, Tübingen, Verhandlungen der deutschen Gesellschaft für Chirurgie, XXV Congress, 1896.

Another important advance was the experience demonstrating the needlessness of tracheotomy, which many operators formerly had considered absolutely necessary in facilitating excision of the goitre and preventing the after-collapse of the trachea. Not only does tracheotomy interfere with aseptic wound-healing, but before as well as after excision of thyroid, it is absolutely unnecessary even in the greatest degrees of compression of the trachea. The respiratory disturbances immediately subside after removal of the goitre. It may be laid down as a rule that even in the greatest dyspnœa and danger of suffocation the operation which is indicated is not immediate tracheotomy, but immediate extirpation of the goitre. The total extirpation of the thyroid as a radical cure, as recommended by Rose, advanced in favor more and more, and reports of 400 such cases were recorded. Its popularity was due to the belief that it prevented recurrence from remaining portions of the gland, and apparently was attended with no greater difficulty and dangers than the partial operation. No doubts existed as to the propriety of removing the whole organ, as at that time the physiological importance of the thyroid was not known. Very soon, however, came the reports of severe after-effects of total operation, such as tetanic convulsions, severe enough to cause death, and that chain of manifestations included under the term "cretinism." An early report from Reverdin, in 1882, failed to attract attention. The next year, at the Twelfth Congress, Kocher communicated his report on "Cachexia

Strumipriva," which made a marked impression. Surgical opinion did not at once universally accede to these views as to the existence and cause of the disease, and not until numerous victims of this condition had been discovered was this long-neglected gland recognized as an important vital organ. Total excision of the thyroid, formerly the routine procedure, was at once forever stricken out as an operation of physiological incompatibility. Conservative surgical methods were now sought for, having for their object the removing of the goitre, but not of the entire thyroid gland. A time-honored method of treatment inaugurated at the beginning of the century by Phillip von Walther, and lately revived by Wölfler, now came into vogue. This is the typical ligature of the thyroid arteries to promote artificial atrophy of the gland. The operation was, however, scarcely performed fifty times in the last decade, having attracted little attention except as a purely theoretical measure, for the richness and irregularity of the vascular supply of the thyroid make the task practically hopeless. An operation which was destined to receive quite a different degree of attention now came to the front. The operation of enucleation, which had occasionally been practised by some surgeons in the case of the cystic variety since its recognition by the Italian surgeon, Porta, in 1840, was now established by Socin as a typical method even in treating the solid forms of goitre. The method received immediate acceptance, and constitutes to-day one of the most notable developments of modern thyroid surgery. Instead of stopping short on the surface of the gland for fear of wounding its veins, in Socin's method the parenchyma of the gland is deliberately divided till the cyst lies exposed, and this is then shelled out by blunt dissection, entailing no loss of normal glandular tissue. The essential principle of the operation lies in accurately locating the capsule of the cyst and keeping absolutely close to it without encroaching on the surrounding glandular tissue and its numerous delicate blood-vessels, a procedure requiring the greatest patience and technical skill. Very often, however, the enucleation is quickly performed, accompanied by little bleeding, without nerve lesion, and the wound healing undisturbed. The operator must have a clear perception of the limitation of the operation of enucleation. It is undoubtedly the normal procedure in the less vascular cystic variety as well as in the solid forms where the nodules are loosely attached and the capsule clearly defined; and, likewise, it is absolutely indicated in goitre involving both sides of the gland where the preservation of gland tissue on one or both sides is absolutely indicated. The operation must not be undertaken when impossible to recognize a definite demarcation between the normal gland tissue and the diseased nodules, or where extensive adhesions are present. Here the procedure is attended with a profuse or uncontrollable hæmorrhage. The character of the operation is terrifying, and not infrequently cannot be carried out to a finish.

We possess in resection of the thyroid a procedure which replaces enucleation where the latter is contraindicated. It has the advantage over enucleation of efficient hæmostasis, and over extirpation in the preservation of normal glandular tissue. Its chief advantage lies in the possibility of varying the method of operating. Sometimes the hilus or the isthmus can be left, or else the lower portion. It can also be combined to great advantage with enucleation. Mikulicz was the first to perform resection of the entire one-half of goitre as a typical operation.

As regards the results of the modern operations, it can be briefly stated that to-day operations for non-malignant forms of goitre are practically without danger, provided interference is resorted to before the advent of serious pulmonary and cardiac complications attending long-continued changes in the gland. It must be acknowledged, however, as regards the ultimate results, that the partial operations have been attended with a considerable proportion of unfavorable results, owing to the frequency with which both diseased and normal glandular tissue is preserved. The recent investigations leave no doubt that the number of recurrences after operations for goitre considerably exceeds our expectations.

It is noteworthy, however, that notwithstanding the numerous recurrences, secondary operations are but seldom called for. The statistics of 800 operations furnished by the cases of Socin, Kroenlein, Kappeler, and the author have in scarcely a dozen cases required operation for recurrences. We are justified in considering operation for the relief of goitre as one of the most useful surgical methods at our disposal, as it brings about an immediate disappearance of the most terrifying asphyxia, and is attended with a result so radical as usually to hold good for the entire existence of the individual.

Charles L. Gibson.

INDEX TO SURGICAL PROGRESS.

GENERAL SURGERY.

I. On the Diffusion of Carcinoma through the Veins. By DR. E. E. GOLDMANN (Freiburg). The diffusion of carcinoma must be attributed to the veins as well as the lymphatics. With the aid of special histological technique (specific stain of the elastic fibres, Unna, Tánzes), it is possible to demonstrate in carcinoma of every variety and situated in all portions of the body that the process has invaded the veins. The changes in the vein are of three principal varieties: (1) The carcinoma perforates the vein wall and the free cancer cells lie in the blood-channels, a venous thrombosis need not necessarily follow, the living cancer cells seeming to possess the inhibitory action on the generation of fibrin exhibited by unwounded endothelium. (2) The carcinoma perforates only the outer elastic layers of the vein wall, develops intramurally, narrowing the lumen and even obliterating it without producing any lesion of the endothelium. In this form the accidental injury of the endothelium alone entails the danger of a hæmatogenous infection. (3) The carcinomatous process infiltrates the wall of the vein at the site of a previously-formed and organized thrombus.

The above changes of the vein wall were observed not only in the primary tumor, but also in the metastases, in the regional lymphatic glands, in the liver, and in the lungs. A similar behavior of the veins seemed to be present in the development of recurrent growths.

Such extensive changes in the vein wall have not previously been observed, as the usual histological methods do not bring them out, the special method being absolutely essential for their demonstration.—*Verhandlungen der deutschen Gesellschaft für Chirurgie,* XXV Congress, 1896.

II. Calcifying Epithelioma. By H. STIEDA (Tübingen). In 1894, Perthes described very carefully a tumor which clinically is usually called calcifying epithelioma. From its distinctive histological constituents, Perthes ranged this tumor in the class of the endotheliomata, and raised the question whether many of the so-called calcifying epitheliomata should not be held to be endotheliomata. Recent pathological investigations have added considerably to our knowledge of the endotheliomata, and there is to-day a pronounced tendency to increase the number of tumors that belong to this category. The work of Stieda is very timely, as it contains a report of three calcifying epitheliomata (derived from Bruns's clinic) which he has studied most exhaustively with reference to Perthes's observations. None of these tumors gave the slightest indication of proliferation or changes of the intima of the vessels. These results are not held to detract in the slightest degree from the correctness of the findings in Perthes's case, but rather to point out that these tumors may have different origins.

The author discusses the various views as to the nomenclature of these tumors, and is satisfied to retain the term calcifying epithelioma, taking the ground that the term epithelioma should not necessarily indicate malignancy, this latter element being characteristically absent in the clinical history of these tumors.—*Beiträge zur klinische Chirurgie*, Band xv, Heft 3, p. 797.

III. The Uses of Silver in Surgery and Bacteriology. By CREDÉ (Dresden). Numerous experiments have demonstrated the value of the silver salts as antiseptic agents. Lactate of silver (known in the arts as actol) was found to possess bactericidal powers surpassing all other antiseptics, including corrosive sublimate. Having the disadvantage of irritating the tissues, eight other silver salts were tried, with the result that the citrate of silver (itrol) was found to possess every quality required of a good antiseptic. Its solubility is 1 : 3800; it is colorless, non-irritating, without odor, and is as efficient as the lactate. Its usefulness has been demonstrated in the treatment of 1400 patients.

Some of the reasons for endeavoring to discover a new antiseptic are: The purely aseptic method is not everywhere and in all cases practicable. The ideal antiseptic, non-irritating, soluble, odorless, harmless to the tissues, applicable in powder form, and possessing an antagonistic action on every form of germ-life that we have to deal with, has not heretofore existed. All these qualities are united in itrol. Its small dosage makes its price small, used as a dressing it can remain unchanged with less irritation than any other substance. It can be used to prepare dressings, silk and catgut. It will be found of service, used subcutaneously, in acute infectious diseases, especially erysipelas.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXV Congress, 1896.

IV. Clinical Observations in the Treatment of Malignant Tumors by Bacterial Products. By W. PETERSEN (Heidelberg). Ten carcinomata and seventeen sarcomata treated by toxines as recommended by Coley. Seven carcinomata by the serum method of Emmerich and Scholl. Constitutional manifestations were most marked in the use of sterile mixed cultures of streptococcus and prodigiosus. The toxines exerted no permanent change, with the exception of a tumor of the parotid which was sufficiently reduced in volume to allow of extirpation and remains well. No improvement followed the serum treatment in any case. The results of these methods are not sufficient to overcome the disadvantages attending their use, danger of toxine-poisoning, especially with the use of prodigiosus, one death being attributed to it, and danger of increasing the activity of the growth. General carcinosis followed the serum treatment in one case.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXV Congress, 1896.

CHARLES L. GIBSON (New York).

V. The Treatment of Furuncles. By DR. LOUIS DUMONT. The vulgar boil and the still more vulgar bubo are always disagreeable and annoying, and sometimes very painful and even dangerous.

Many remedies, both for internal medication and for external application, have been tried at various times with varying success.

The method of the author consists of an application of the method of linear scarification used in ulcers and some of the chronic skin-diseases, and, according to the writer, who has tried it for some years in the military service and upon some hundreds of cases, the results are very satisfactory. The skin over the beginning pustule or boil is first cleaned with a brush and an antiseptic solution (1 : 1000 bichloride; 1 : 50 carbolic); several parallel incisions are then made, a millimetre apart, through the dermis; a similar series are made at right angles to the first; a wet antiseptic dressing is then applied. When this treatment is instituted early in the disease, the pain, redness, and swelling will usually disappear within the first twenty-four hours. This procedure has the advantage over the common crucial incision in that the bleeding is more free, the access of the antiseptic is made more easy, cure is more speedy, and the scar is practically absent.—*Annales de Dermatologie et de Syphilologie*, Tome VII, No. 11, 1896,

HENRY P. DE FOREST (Brooklyn).

NERVOUS AND VASCULAR SYSTEMS.

I. End-to-End Suture after Resection of Blood-Vessels injured in Continuity. By J. B. MURPHY, M.D. (Chicago). Two cases in the human subject are reported, both in adult males. In the first case the femoral and internal saphenous veins were perforated by a pistol-bullet. They were exposed by incision, the wounds in the saphenous vein were sutured with a continuous silk suture; the wounds in the femoral vein, after double ligature of the profunda branch, were likewise sutured; at the end of five weeks, during which deep free suppuration had been going on in the wound, evidences of extensive active hæmorrhage developed, which, on laying open the parts, was found to come from a slough which involved the inner side of the femoral artery for one inch in extent. The artery was ligated above and below the damaged area, which was resected. Recovery followed without œdema or other evidence of circulatory disturbance of the limb.

In the second case the common femoral was perforated by a pistol-bullet, which passed through the centre of the vessel at a point about one and a half inches below Poupart's ligament. The bullet carried away the greater portion of the walls of the artery, and, passing downward and backward, perforated the femoral vein just above the junction of the profunda. The artery was temporarily secured by clamps, which gently compressed it, while the wounds in the vein were sutured. By the suturing the calibre of the vein was greatly diminished, but soon it dilated to about one-third its normal diameter. Two inches of the artery were then exposed and freed from all attachments, and half an inch of its continuity resected, including the wound opening. The proximal end was deprived of its adventitia for a third of an inch, and then invaginated into the distal end to that extent by four double-needled threads, which penetrated all the walls of the artery. A row of sutures was placed around the overlapping distal end, the sutures penetrating only the media of the proximal portion. The adventitia was then drawn down over the line of union and sutured, and the clamps were removed. Not a drop of blood escaped at the line of suture, and pulsation was immediately restored in the vessels below. No œdema of the leg followed, and the circulation of the limb was good continuously from the time of operation. The wound suppurated, but healed satisfactorily.

The author reports the details of a large number of experiments on animals in resecting and suturing blood-vessels. He concludes that the procedure is only applicable to large-sized vessels, and gives the caution that the vessels must be handled with great care and delicacy to avoid thrombosis and injury to the intima and consequent inflammatory complications. The indications for the procedure are found in injuries to large vessels, whether operative or in the course of accidental wounds, and in the treatment of certain aneurisms of traumatic origin. The technique is sufficiently described in the account given above of the second case.—*Medical Record*, January 16, 1897.

II. The Late Results of Thiersch's Method of Nerve Evulsion. By Dr. Angerer (Munich). The author has performed this operation, since 1889, on twenty-six patients, fifty-two nerves being removed for the relief of trifacial neuralgia in all but one case. Of the twenty-six patients, seventeen are now free from pain, in sixteen, four years have elapsed since the operation. Three required further operation, and three out of the remaining twelve present a recurrence. Seven patients remain to-day free from pain, four years after operation. Experience shows that the extraction should be performed even more slowly than Thiersch recommended, twenty centimetres of nerve, including the finer twigs, may thus be removed. As a prophylactic measure, the seemingly healthy divisions of the nerve should also be removed as the neuralgia rarely remains confined to one branch. There is never any complaint of the resulting anæsthesia. The prophylactic operations may prevent the occurrence of a return of symptoms and of resort to the severer operations at the base of the skull. In the discussion, Helferich (Greifswald) recommended a permanent plugging of the nerve-canal to prevent reunion of the nerve-ends, either with a metallic substance or a fragment of bone.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXV Congress, 1896.

Charles L. Gibson (New York).

REVIEWS OF BOOKS.

Fifty-Four Consecutive Ovariotomies. By A. C. Butler-Smythe, F.R.C.S.(Ed.), and F.R.C.P.(Ed.). 8vo, p. 119. London: J. & A. Churchhill, 1897.

This little book records all the ovariotomies done by the author up to the end of October, 1895. Its chief interest is in the fact that only one death attended the series, that being in the person of the fourth case, so that he is able to say that he has had fifty consecutive cases without a death. The good results he attributes mainly to simple methods of aseptic technique. At the beginning he details, though with brevity, his methods. Most surgeons will esteem these introductory pages as valuable, for it is always of importance to know by what special methods unusually good results have been obtained. There is nothing new or peculiar, however, about the methods here described. He has been ready to use drainage, having resorted to it in twenty-five out of his fifty-four cases. This probably has been the prime factor in securing the results he reports. A number of desperate cases have been favorably affected also by the use of abundant flushings of the peritoneal cavity with warm boiled water. He has also resorted, as a matter of routine, to small doses of opium and belladonna during the first twelve hours after operation. The cases in quite a large number of instances contain notes as to the personal appearance of the patients, which are unusual in literature; thus, five of them are described as "pale-faced," five as "thin-" or "sharp-featured," two as "dark-featured," three as "sallow-complexioned," four as either of "bright" or "high color" or "pink complexioned," or of "flushed face," in three cases their faces were either "anxious," "emaciated," or "hollow cheeked," while in three other cases the face was either "round," "full" or "merry;" a "putty face" and a "pasty face" were each noted in one instance, while, finally, one patient each was either "nervous-" or "tubercular-looking." In twenty cases the color of the hair is given. The dark-haired ones predominate, being one-half of the whole, with an additional one to whom is attributed black hair! Four had brown hair, two had "iron-grey" hair, while in one other case the hair was simply gray. In only two cases was the hair stated to be of fair or light color! What the bearing of these data may be upon the development of tumors of the ovary, or upon the results of operation for their removal, does not appear.

LEWIS S. PILCHER.

CONGENITAL DISLOCATION OF THE HIP. By DR. EDOUARD DELANGLADE. Paris.

A very studious monograph of 332 pages, based on observations of 112 cases, chiefly derived from the practice of Broca and Lannelongue, and presumably representative of the practice of the French school. Etiology, anatomy, and pathology are treated in great detail, and the various conflicting theories presented with impartiality. Full histories of 135 cases are given; among them are several valuable reports of autopsies after operation. It is interesting to note that Broca has now abandoned his modification (osteotomy of the great trochanter) of Hoffa's operation to join the large number of surgeons who have adopted Lorenz's operation. Purely orthopædic reduction and treatment find but little favor, only a few cases were so treated with unsatisfactory results.

The criticisms advanced against the operative treatment of congenital dislocation have been too much influenced by the earlier mishaps during its period of evolution. With perfected methods the operation in the hands of a well-equipped operator should be without danger.

Relapses are due to insufficient depth of the acetabulum or to anteversion of the neck of the femur. Perfect restoration of form and function is the exception. There usually remains a slight shortening and a trifling limp and a little limitation of motion, but the deviation of the limb is in a great measure corrected, the limp is infinitely less, and its character changed, endurance of fatigue is considerable and the pain is suppressed; and above all the future is no longer menacing but rather encouraging, for the functional condition always tends to improve, and the patient must wait a year before realizing the full benefit of the operation. There are thirty-six illustrations, some of them good. The bibliographical index, notwithstanding its length, should give rise to no illusions as to its completeness.

CHARLES L. GIBSON.

AUTOSCOPY OF THE LARYNX AND THE TRACHEA. By ALFRED KIRSTEIN, M.D., Berlin. Authorized Translation by MAX THORNER, A.M., M.D., Cincinnati, O. New York: The F. A. Davis Co., 1896.

This little book gives a very good description of the theory and practical application of the direct method of examination of the larynx and trachea. It shows with what facility, after a little practice, these parts may be examined by direct vision, and without the use of mirrors. Briefly the method is as follows: The patient tilts his head slightly upward, and the physician presses the base of the patient's tongue forward with a spatula.

The translation has been well done; and the book should be read by all who have to do with these parts.

JAMES P. WARBASSE.

TRANSACTIONS OF THE AMERICAN SURGICAL ASSOCIATION. Edited by DE FOREST WILLARD, M.D. Philadelphia: William J. Dornan, 1896.

With each succeeding year the reports of the transactions of the American Surgical Association continue to increase in richness of material and in scientific value. This fourteenth volume, which contains the papers and discussions of the meeting held in 1896, is a well-edited and handsomely printed book of 750 pages. Among the subjects to which the association gave especial attention was surgical tuberculosis, upon which subject were several papers, each dealing with a different region. The ambulatory treatment of fractures of the lower extremity was discussed. In all, thirty-six papers were presented, all of which represent a high class of surgical work.

It is worthy of note that the committee on the nomenclature of tumors has been continued, and that it is probable that the classification which it presented to the association may receive still further revision.

James P. Warbasse.

Diagnostik der Harnkrankheiten. (Diagnosis of Urinary Diseases.) By Professor C. Posner. Pp. 166. Berlin, 1896.

This work is virtually a reproduction of the ten lectures which Professor Posner gives as an introduction to his course in the pathology and therapeutics of the urinary organs.

The first chapter is devoted to the consideration of the relations of urinary diseases to the general system. The next four chapters give a very clear explanation of the urethral excretions, disturbances of urination, and an admirable scheme of urine examination. Inspection and palpation of the urinary organs are treated most instructively in Chapter VI. The remainder of the work is devoted to the methods of examining the urethra and bladder, the chapter on cystoscopy being especially practical.

All the methods described show an intimate appreciation of the latest advances, while the author's discernment of the proper sphere of usefulness of the various steps is clearly expressed by the following: "The tendency of the present time is immediately to begin with the greatest refinements, and to treat with sovereign contempt the older simple methods. In the examination of a pathological specimen, resort is immediately had to-day to the oil immersion lens and complex stains, while the young practitioner is inclined to pass final judgment on a case of bladder-disease by beginning with a cystoscopic examination. Both methods are equally false; . . . it is only after a painstaking consideration of all the phases of the disease, one after the other, that one will be in a position to see correct images on a bladder mirror and—what is moreover quite a different matter—to understand them."

All the teaching shows a spirit of judicious conservatism. Of especial value is the warning contained in the introduction, that disease of the urinary organs, unlike other regions of the body, often presents conditions which compel us to refrain from using the very methods or instruments ordinarily of the greatest value in establishing a diagnosis.

Charles L. Gibson.

An American Text-Book of Applied Therapeutics for the Use of Practitioners and Students. Edited by J. C. Wilson, M.D., assisted by Augustus A. Eshner, M.D. Royal 8vo, pages 1326. Illustrated. Philadelphia: W. B. Saunders, 1896.

"The arrangement of the book has been based, as far as this has been possible, upon modern pathologic doctrines, beginning with the intoxications, and following with the infections, diseases due to internal animal parasites, diseases of undetermined origin, and finally the disorders of the several bodily systems, digestive, respiratory, circulatory, renal, nervous, and cutaneous. It has been thought proper also to include a consideration of the disorders of pregnancy.

"The endeavor has been to conform to the title of the work, Applied Therapeutics, and to indicate the course of treatment to be pursued at the bedside, rather than to name a list of drugs that have been used at one or another time. The thought has been invariably clinical and practical."

Space will not permit an exhaustive review of the many well-written articles, but attention must be directed to a few of much more than ordinary value to the practitioner.

In no department of modern therapy have such advances been made as in the treatment of diphtheria, and it would be difficult to find the present status of this treatment presented in a better way than in this volume. The usual forms of local applications, medication, inhalations, and sprays are given, the technique of intubation is illustrated and described, and at the close of the chapter the method of preparation and use of diphtheria antitoxin is emphasized. The author's conclusions agree with those of Welch; "anti-diphtheritic serum is a specific curative agent for diphtheria, surpassing in its efficacy all other known methods of treatment of this disease. It is the duty of the physician to use it."

No such a revolution has occurred in the therapy of typhoid fever, but the chapter devoted to this subject is so exhaustive that it is in itself worthy of a review. All established methods of treatment are described, and their merits and disadvantages carefully compared, and illustrated by mortality tables, temperature charts, and bedside notes of actual cases.

The articles upon syphilis and tuberculosis are excellent.

In the methods of treatment applicable to special systems of the body the upper air-passages, the broncho-pulmonary apparatus, neurasthenia, epilepsy, occupation neuroses, and mental diseases, the last illustrated with numerous photographs of patients, are noteworthy.

Among the rarer conditions described may be mentioned food infection, drug habits, obesity, scurvy, Weil's disease, infant feeding, injuries due to electricity, or external heat, and the disorders of sleep.

Still more specialized chapters are at the close of the book: the diseases of the skin and its appendages by Henry W. Stelwagen; and the disorders of pregnancy by Theophilus Parvin.

H. P. de Forest.

CORRESPONDENCE.

DISAPPEARING TUMOR OF THE ABDOMEN.

It is impossible to anticipate the degree of perfection to which abdominal surgery will be carried when all the elements of the function of the peritoneum are unfolded to the profession. That delicate envelope of the abdominal viscera, once the dread to the operator, has now, through the intervention of aseptic procedures, become the "surgeon's friend." The recent treatment of tubercular peritonitis by opening and flushing the abdominal cavity or, in the hands of some operators, by the mere incision has demonstrated another happy faculty of the peritoneum, the *rationale* of which, however, is still a matter of conjecture. Whether the contact of the atmosphere or the solution used stimulates the functional activity or the counter-irritation of the incision brings about this change is a question yet to be settled to the satisfaction of investigators. Each phenomenon has its advocates and contestants. That the peritoneum does digest and absorb tissues and exudates foreign to its environment has been demonstrated in cases of advanced ectopic gestation; the question remaining is, to what extent this function may be exerted. Some clue is furnished us in cases of localized peritonitis with or without circumscribed abscess, showing a disposition of the peritoneum to cut off and localize pathological processes when the latter are of such magnitude that dissipation and absorption are rendered impossible; in such cases a wonderful degree of tolerance is manifest in the circumscribed agglutination in an effort to prevent general involvement. The same conservatism is observed in the rapid healing —eight to twelve hours—of the opening in the peritoneum under aseptic conditions, walling off external influences. In these studies we have the most remarkable illustrations of the activity and vitality of amœboid life, for such inhibitions of life, selective and discriminating in its work, can be explained upon no other basis.

This characteristic of the peritoneum has been observed as the result of some truly conservative operations of recent date upon obscure and inoperable tumors of the abdominal cavity, establishing the class of disappearing tumors, a term decidedly unscientific, yet highly suggestive.

A case of this nature came into my hands a few months ago, and observing six such cases recorded in the December issue of the ANNALS OF SURGERY, I have been moved to forward the following report of it.

In October I was called to Central Kansas, in consultation with Dr. T. O. Burris, in regard to Mr. H. F., aged thirty-five years, who presented the following history: General health for years fair; never robust. Family history good; parents living and aged; no history of tuberculosis. For the past year had been losing flesh and strength; appetite indifferent; no vomiting; bowels regular. Three months before had noticed a lump in his abdomen near umbilicus, attended with but slight pain except when lying on his right side.

For six weeks, had been confined to the house on account of weakness,—in bed most of the time. Examination revealed a mass, the size of a goose-egg, one inch to the left of the umbilicus, movable two inches to the right of the median line, where it was lost to the touch. Knee-chest position revealed nothing additional. Examination of kidneys determined them in position. Stomach much enlarged; foul eructations, but no vomiting. Emaciation was marked, but not profound. Lungs normal. Abdominal palpation developed no enlarged glands. In the face of a grave prognosis an operation was advised. Patient consented and preparations were made to operate next morning at ten. An incision three inches in length was made to the left of the umbilicus. Some adhesions were broken up around the mass, and, to expedite delivery, the incision was enlarged by the scissors an inch to the right. The mass was found adherent to the lesser curvature of the stomach, arising at once from the left lobe of the liver and the superior mesentery. So much structure was involved and the patient in such a state of collapse it was deemed best to close the wound without attempting excision. The gauze pads were removed, a few bleeding points tied, and the abdomen closed with a deep suture. The shock was so profound no time was taken to separately close the peritoneum. The patient was put to bed with a temperature of 95° F. For two days the temperature remained subnormal. Strychnine was given under the skin, and whiskey with milk enemata at frequent intervals. During the third day the stomach tolerated liquids, the wound healed well, and in three weeks patient was sitting up. The pain which was severe at first subsided, and in two weeks disappeared. Since operation patient has gained strength and flesh. Two weeks ago the attending physician wrote me the mass had disappeared and the patient was in better health than he had been for years.

J. MALSEED BELL, M.D.

ST. JOSEPH, MO.

THE TREATMENT OF VARICOSE VEINS.

AFTER ten years' operative experience I have come to the conclusion that nothing short of total extirpation of the diseased portion of vein merits the term radical.

In numerous instances I have performed the orthodox operation,—*i.e.*, removal of many bits; and I regret to say that in a considerable percentage the cure has by no means been permanent.

On referring to one of our most recent standard works, "An American Text-Book of Surgical Science," I find the treatment of this very common complaint is dismissed in some six lines, and I will take the liberty of quoting the following paragraph: "The radical treatment has for its object the complete obliteration of the vein. Many surgical procedures have been devised for this purpose. Of these methods, multiple ligature, as advocated by Dr. Charles Phelps, who ties the vein in thirty or forty places, and excision of the vein in six, eight, or more places are the best." It is needless to mention that neither of these operations can be really described as radical, for complete obliteration does not necessarily follow even forty ligations or the removal of even a dozen pieces.

In the operation that I have practised for the past year and am about to describe, no potential element remains, for the very simple reason that the offending portion of the vessel is removed in its entirety.

The limb having been shaved and disinfected from Poupart's ligament to the ankle, a two-inch incision is made over the saphenous opening, and the internal saphenous trunk is doubly ligated and divided ; if no varicosity is present above the knee the wound is closed and dressed at once with iodoform gauze. If the femoral portion is affected, after ligation at saphenous opening, the vein is dissected up and its tributaries seized with pressure-forceps and ligated. In nearly all cases, if varices are present above knee, there are also some below, consequently the incision is prolonged downward directly over the vessel until the lowest limit of the disease is reached ; the vein is then tied and divided below. In some cases an eighteen- or twenty-inch incision is necessary.

If the disease does not extend above the knee, after occluding the saphenous trunk as described above, an incision is made over the affected portion, a ligature is applied above and below, and the whole mass removed by dissection. It is surprising how easily and rapidly the latter manœuvre may be carried out. Of course, all branches are caught up with pressure-forceps, and when the main channel is removed they are ligated. As frequently the external saphenous vein is also affected, its varicose portion is dealt with in a similar manner. To any one unaccustomed to a ten- or twenty-inch incision this plan may appear formidable, yet if the vessel is ligatured above and below the varicose area, there is not the slightest danger of emboli or pyæmia, and as for hæmorrhage, it is so trivial that it does not deserve mention. In a recent severe case I removed twenty-six inches of the internal saphenous, and certainly the blood lost did not exceed two ounces. I have also employed this method in removing large thrombosed veins occurring in the first few months of pregnancy; in this class, above all others, it is particularly necessary before manipulating the diseased portion to occlude the main vein well above the seat of disease, so that if thrombi are dislodged they cannot pass into the general circulation.

The time occupied in executing this method certainly does not exceed that of any of the nibbling processes. As to primary union, I find these long wounds heal just as kindly as do the short ones, and with ordinary surgical cleanliness there is nothing to be feared. The insertion of a strand of iodoform gauze as a drain to every four inches of wound is a useful precaution, for it does away with the risk of any blood collections. Personally, I fear the presence of stagnant blood in wounds more than I do germs; where the former is doubtless the latter will gain access.

No bad results have so far followed this method, and all the patients appear grateful.

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CERTAIN INTERMITTENT CYSTS OF THE OVARY AND KIDNEY.

By THOMAS WILSON, M.D., F.R.C.S.,

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AMONG the cysts which occur in the abdomen a class is found, clinically, in which the tumor from time to time disappears, either, as it may seem to the patient, wholly or in part. These cases are not very uncommon, and usually something like the following history is obtained: After the abdomen has been observed to be increasing in size for a variable time, usually some months, large quantities of urine begin suddenly to be passed, either with or without some obvious cause; in the course of a few days, *pari passu* with the polyuria, the tumor disappears and the abdomen becomes flat; sometimes there is a history of one such occurrence, and no reappearance of the tumor; much more frequently the cyst gradually refills, and the processes of bursting, of diuresis and disappearance, and of refilling may be repeated many times. Now the first thought that occurs to one's mind is that such a case must be one of intermittent hydronephrosis, and frequently this is so. Morris collected forty-seven cases of hydronephrosis causing abdominal tumor, in six of which the tumor spontaneously subsided altogether and did not reappear, while in six others the cyst showed marked intermissions in size. He goes on to remark that no doubt many cases which have been looked upon as ovarian and which have vanished spontaneously have been in reality cases of hydronephrosis. In twenty-three cases where the renal cyst did not intermit, twelve affected females, and of these twelve, seven were diagnosed as ovarian and five operated upon on that view of their nature. In the intermittent cases Morris remarks that "the subsidence of the swelling is no doubt followed by the discharge *per urethram* of an increased quantity of urine, and when this can be proved to occur, we obtain a most important diagnostic sign of hydronephrosis."[1] I propose to collect the proofs that this sign is not pathognomonic of a renal affection, but is an equally characteristic occurrence in connection with certain ovarian cysts. The proof must rest on the comparison of the result of operation or post-mortem examination with the clear history or observed progress of cases. In the following case an "oligocystic" tumor of the ovary, one of that uncommon type of large cyst otherwise known as dropsy of a Graafian follicle, had burst into the peritoneum and disappeared with profuse diuresis on several occasions, and healed scars were found in the wall of the cyst when this was removed by operation. I have to express my sense of the kindness of my senior colleague, Dr. Malins, in allowing me to retain the care of this patient.

CASE I.—*Large Abdominal Cyst for Six Years; Repeated Disappearance, associated with Polyuria; Removal of Unilocular Ovarian Cyst, showing Cicatrices in Walls; Smooth Recovery.*—R. B., a married woman, aged thirty-one years, was admitted to the Birmingham General Hospital on December 30, 1895, complaining of a large abdominal swelling, which had been first noticed six years previously, and had gradually and painlessly increased. On at least six or seven occasions, without any pain, the swelling had disappeared, and in the course of three or four days, to use the woman's own graphic simile, the abdomen has become "as flat as a fish." At these times, and during the same three or four days, large quantities of urine have been passed, very clear in appearance, showing no signs of blood or matter or anything of that kind. The first occasion on which the swelling went down was about four years ago, during a pregnancy. In the last twenty months, for the whole of which time she has been suckling her last child, the disappearance has taken place on three occasions, the last being in July, 1895. In each interval the abdomen has gradually filled up again and has become larger than it was before, so that on the whole the increase in size has been progressive. The patient has had five children, the last twenty months ago; two miscarriages. The catamenia have not reappeared since the last confinement, lactation having continued until a day or two before admission.

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[1] Diseases of the Kidney, p. 311.

On admission, the patient, who was of less than the average height and build, had a thin "ovarian" face, and was generally emaciated. There was very great prominence of the abdomen anteriorly, more marked below the umbilicus; no bulging in the flanks. The enlargement began at the epigastrium and gradually increased to a little below the umbilicus; the anterior abdominal wall then curved rather sharply round to the pubes, the lower part overhanging that bone to some extent. Numerous large veins are seen over the front of the abdomen, for the most part running vertically; there are well-marked lineæ albicantes. The umbilicus is flattened and obliterated, not pouting. The surface of the swollen abdomen is regular, and there are no nodules or irregularities of any kind to be seen or felt. The swelling feels moderately soft and yielding all over, and a free fluctuation-thrill is obtained from any one point to any other. Measurement gives the distance from the pubes to the umbilicus as thirteen inches; from umbilicus to ensiform cartilage, twelve inches; from umbilicus to right anterior superior iliac spine, thirteen inches; to left spine, twelve inches; girth at the umbilicus, forty-three inches. There is dulness on percussion all over the front of the abdomen and in both flanks; upward the dulness extends to the lower end of the sternum, and to the margin of the thorax on each side. Over the lower part of the sternum there is resonance on percussion, and in the left lower axillary region there is high-pitched resonance. The cardiac impulse is best felt round the left nipple, and the sounds are best heard in the same position; there is a soft systolic murmur at the apex.

Vaginal examination showed that the cervix, bilaterally lacerated and placed rather lower in the pelvis than natural, pointed downward, backward, and a little to the left; the body of the uterus, of natural size, had its long axis running upward, forward, and a little to the right; the sound passed two and a half inches. Behind the uterus was the lower end of the abdominal swelling; this was examined by one finger in the rectum and one in the vagina, and gave the impression that Douglas's pouch was filled by the lower end of a rather soft and flaccid cyst; at the sides of the lower end were felt two or three small firm masses.

At the operation on December 31 a three-inch median incision was made half-way between the umbilicus and pubes, and was afterwards enlarged to six inches. Twenty-eight pints of clear, colorless fluid were removed from a cyst which was firmly adherent over an enormous area of the anterior abdominal wall. To enable the upper part of the parietal adhesions to be dealt with, a second incision of two and a half inches in length was made half-way between the umbilicus and the ensiform cartilage; at the upper end there were firm adhesions to the round ligament of the liver. The upper end of the cyst, still adherent to the anterior abdominal wall, extended up in front of the liver, with which organ there were some membranous connections. All the adhesions were separated with the fingers; the raw surfaces bled rather freely, but the bleeding soon ceased spontaneously, only a few points requiring to be ligatured. There were no adhesions to the bladder or to the other abdominal viscera, with the exception of the liver. The cyst was found to have a broad pedicle, containing very large vessels, and formed by the left broad ligament. A fine silk ligature was placed on the ovarian vessels; the pedicle was transfixed and tied in two interlocking silk ligatures, and the cyst was cut off. The right ovary and tube were normal, and the uterus natural in size and appearance. The peritoneal cavity was sponged out; no flushing or drainage employed; the abdominal wounds were both closed with deep silk sutures. The patient made a smooth recovery, and was discharged well on January 18, 1896.

The cyst was a thin-walled one with smooth lining; two secondary cysts, the size of a pea and a marble respectively, projected on the inner surface at a considerable distance from each other; these contained clear limpid fluid. In three places the wall was thickened and puckered and more opaque, giving the appearance of having been ruptured and healed by fibrous tissue. The peritoneum was not separable from the wall of the cyst; a fair number of large vessels coursed in the wall. The Fallopian tube was about five inches in length and was rather thinner than usual. The mesosalpinx was free in its whole extent; the parovarium was clearly visible and seemed to be normal. No trace of the ovary could be seen.

The fluid appeared at the time of removal to be similar to that obtained usually from parovarian cysts; it was very limpid and almost colorless. A specimen was sent to the pathological department, but, owing to a misunderstanding, it was unfortunately not examined chemically. Under the microscope only some red blood-corpuscles were seen, evidently due to contamination in removal. The patient was seen again on February 14, looking and feeling quite well. The scars of the incisions were linear, the lower measuring four inches, and the upper one and a half inches. Measurements from umbilicus to lower end of sternum, six and a half inches; to pubes, five and a quarter inches; to right anterior superior iliac spine, five and three-quarters inches; to left, five and a quarter inches; circumference at umbilicus, twenty-nine inches.

The cyst in this case had many of the characters and appearances of the unilocular parovarian one, but that it really originated in the ovary is clear, because the mesosalpinx and the parovarium were free and normal in appearance, while no trace of ovary was found either at the operation or on subsequent careful examination of the parts removed. Another peculiarity which helps to distinguish from a parovarian cyst was afforded by the impossibility of separating the peritoneum from its surface. I am not aware of any previous case on record in which an unilocular ovarian cyst has been proved to go through the process of spontaneous bursting and disappearance, although this class of cyst is described as being liable to the accident.

Unfortunately, in many cases in which the proof of the occurrence of disappearance with diuresis is complete, the description is insufficient to enable us to distinguish the exact nature of the cyst. The one, however, in connection with which the accident most commonly happens is undoubtedly the unilocular parovarian. In the common multilocular glandular form of ovarian cyst, bursting of a loculus with escape of the contents into the peritoneal cavity is far from uncommon, but it is not proved that the fluid, when it has the usual more or less gummy consistence, can be absorbed and discharged with an increased secretion of urine. Further careful observations are required on this point.

In the following cases, collected from the scattered literature of the subject, the evidence that the process under consideration had taken place in connection with cysts of the ovary was completed by operation or by post-mortem examination.

Blundell describes a case where an ovarian cyst ruptured as the result of a fall; disappearance of the tumor followed, accompanied by profuse diuresis; the patient subsequently died from retroversion of the pregnant uterus. Post-mortem examination showed adhesions about the uterus and the remains of the ruptured cyst.

J. B. Brown mentions several instances where ovarian cysts had burst spontaneously, the patient recovering; and he refers to one case of his own, in which a young lady remained well for many years after the bursting of a cyst; this patient finally died of inflammation of the brain, and at the post-mortem examination a collapsed cyst with thick, semi-cartilaginous walls was found resting on the ilium.

Meredith describes a case where a cyst had ruptured repeatedly during the nine years preceding operation; there was copious diuresis on each occasion and spontaneous reduction in the size of the tumor, which afterwards rapidly refilled. The cyst was a multilocular one, and showed scattered all over the wall of the main cyst patches of degeneration of tawny or ochreous color. Sutton[1] refers to the same case, and concludes that the cyst was parovarian.

Lambert describes the case of a multipara, aged fifty years, who had had an ovarian tumor for nine years before the report. In April, 1869, this diagnosis had been made by Simpson, and operation declined by the patient; in August, of the same year, the woman was thought to be dying from the great bulk of the tumor, when suddenly rupture took place with symptoms of syncope or collapse; at the end of twelve hours the whole body began to swell, even the eyelids being closed by œdema; then began micturition of "cystic fluid" every ten minutes, so that in four days sixty-five pints of fluid were passed; the tumor had then disappeared. From 1870 to 1877 the cyst ruptured with the symptoms just described, and again filled, no less than thirty-four times. The cyst then became so large that the patient was tapped four times, and, finally, septicæmia setting in after the last tapping, ovariotomy was performed, the woman recovering. At the operation, which was done with Listerian precautions, a suppurating cyst with many adhesions was removed; on the inside of the cyst were "countless thousands of glandular neoplasms, undergoing cystic, colloid, and every other form of degeneration."

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[1] Diseases of the Ovaries, etc., First Edition, p. 150.

Soltau describes a case in which, at the post-mortem examination a large cyst of the left ovary was found, having attached to it several cysts from the size of a fœtal head to a hen's egg; the cyst was universally adherent, and could not be dissected to show signs of previous bursting. The patient was a II-para, aged thirty-four years, and the cyst had burst three times at intervals of four months, the first time as the result of a fall on the abdomen, and the other two times spontaneously; diuresis and disappearance of the tumor followed on each occasion. Tapping had been carried out once before the first rupture, and thirty-seven times after the third and last rupture. The fluid varied in different tappings; sometimes it was clear, colorless, and limpid, at others, clear and thick, and, at still others, grumous and dark-colored.

Disse relates a case in which the patient recovered from one bursting, the fluid being discharged by the kidneys. After a few years the tumor burst again, the rupture on this occasion being verified by post-mortem examination.

Barnes mentions three specimens in the museum of Guy's Hospital which show clearly that an ovarian cyst may burst into the peritoneal cavity, and the patient live long enough for cicatrization of the rent, partial or complete, to take place.

Olshausen says that he has seen cases of parovarian cyst in which rupture had occurred dozens of times, and that scars are not uncommonly observed on the thinnest parts of the cyst wall.

After bursting, the cyst may be permanently cured; in this event a permanent breach in the wall is supposed to allow the cystic fluid to escape as it is formed into the peritoneal cavity, whence it is at once absorbed by the lymphatics and discharged by the kidneys.

In by far the majority of cases the hole in the cyst wall becomes closed and the fluid collects again in a longer or shorter time, sometimes in a few weeks, sometimes only after several years, even as many as six or eight. These last cases must be borne in mind when considering reported cases of permanent cure, in many of which the account is published too early to allow the cyst fair time for refilling. Thus, in a case recently reported,[1] rupture took place nineteen days after confinement, and the patient left hospital a few days afterwards "rejoicing at her escape from an operation," the necessity for which is most likely only deferred for a time. The processes of bursting and refilling may be repeated few or many times. In Meredith's case the cyst ruptured thirty-four times in nine years; nevertheless, the only adhesions found were a few threads about the site where the cyst had been once tapped, four months before the first spontaneous rupture; the cyst had never incapacitated the patient from her work as a house-maid for a single day.

The importance of the diagnosis between ovarian cyst and hydronephrosis is not only scientific but practical. The correct treatment differs; in ovarian cyst, extirpation is indicated; in hydronephrosis tapping, followed by incision into the cyst if it refills, is the best treatment, according to Morris. Extirpation is the last resource, and should be performed through the loin. Of sixteen abdominal nephrectomies collected by Morris in 1885, nine died and seven recovered; among the sixteen, seven had been diagnosed as ovarian, and of these seven four died and three recovered. The failure in diagnosis is, therefore, a very serious matter for the patient, and nothing need be added to emphasize the practical necessity of forming a correct opinion of the nature of a given cyst. The difficulty which is experienced in arriving at a diagnosis where the cyst is large is well exemplified by a case referred to by Heinrichs at the Berlin Obstetrical Society on February 14, 1896. The patient came under the care of A. Martin with a huge cyst filling the abdomen; the tumor had first been observed during a pregnancy, and appeared to burst while the placenta was being expressed by Credé's method; this accident was followed by profuse diuresis and disappearance of the swelling. In the next pregnancy the tumor appeared again; this time it did not disappear after delivery, but went on increasing in size. The clinical diagnosis of ovarian cyst was made; at the operation the tumor appeared to be a primary cyst of the mesentery of the descending colon, which piece of intestine coursed over the whole extent of the swelling. Anatomical examination showed the cyst to be a hydronephrosis; it contained seventeen litres of fluid. The patient made a good recovery.

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[1] Lancet, Vol. II, 1896, p. 809.

In the early stages of renal and ovarian cysts the diagnosis is as a general rule sufficiently easy. The renal swelling fills one flank and extends forward in the subperitoneal connective tissue, carrying the peritoneum forward; this accounts for the fixity and immobility of the tumor, and for the dulness to percussion in the loin. At the same time the ascending or descending colon, according as the tumor is right or left sided, is pushed forward and is found coursing over the front of the tumor. All the borders of the swelling are rounded. The upper border makes an acute angle with the margin of the thorax; the lower border can be well defined by the hand pressed in above the pubes. Contrast this with the moderate-sized ovarian cyst which is median in position; rises out of the pelvis, so that the hand cannot be passed in between its lower end and the pubes; is fairly freely movable, and has no intestine in front of it, while both flanks contain intestine, as is proved by resonant percussion note.

In these moderate-sized cysts difficulty may arise on the one hand when an ovarian cyst has become fixed high up on one side of the peritoneal cavity, as may sometimes happen in the course of a pregnancy; and on the other when cystic dilatation affects a floating or congenitally misplaced kidney, a change which is not very unfrequent.

But in cysts, such as the one of Martin's just mentioned, which fills the whole abdominal cavity, the diagnosis may become difficult even to impossibility. Many of the mistaken diagnoses have, however, been due to want of alertness, and Olshausen remarks that in nearly all the cases on record there has been some characteristic or other that might have shown the true nature of the cyst, if it had been looked for.

In these very large cysts examination will disclose in either case an abdomen with a prominent anterior swelling more or less symmetrical, obliterating the umbilicus; the consistence is more or less firmly elastic or fluctuating; considerable variations in consistence and resistance over different portions of the tumor is suggestive rather of ovarian disease; either in hydronephrosis or in an ovarian cyst which is unilocular or has one large, leading cyst anteriorly, free fluctuation wave may be obtained from any one point to any other of the surface. The tumor is not movable in either case. Percussion may afford important evidence. A kidney cyst pushes the intestine over towards the opposite side, so that the side on which the cyst began is dull all round the flank, and the posterior lumbar region is dull up to the spine; the opposite flank is resonant. An ovarian cyst carries the intestines upward and backward, and should be surrounded by an area of resonance, which embraces both flanks. But if the intestines are empty of air and collapsed there may be, and often is, dulness in one or even both flanks.

The most important point in the examination of the abdomen is to make out whether or not intestine runs over the front of the tumor; if it does, the case is not one of ovarian cyst, unless, as might be supposed to happen, a loop or two of intestine has early become adherent to the front of the cyst. If the tumor is a renal cyst, the intestine over the front of the tumor is a portion of the large gut. This when empty and collapsed may be recognized by palpation as a cord coursing over the tumor, and capable of being displaced to and fro over the surface to a certain limited extent; sometimes a gurgling or the sensation of flatus passing may be observed. If the intestine contain gas, percussion will define it as a band of resonance over the elsewhere dull area of the cyst. In case of difficulty or doubt, it has been recommended to inject the large gut through the anus, or to pass a tube through the rectum and into the descending colon, if we have to do with a left-sided cyst. The last suggestion is impracticable, since it has been proved to be impossible to pass a tube through the windings of the sigmoid flexure. Fluids or gases injected into the rectum may reach the ileo-cæcal valve, but will not pass beyond it. By means of injection, then, we may succeed in mapping out the large intestine. As material for injection, ordinary water or normal saline solution has been recommended, but air or gases present the advantages of greater lightness, of being better tolerated, and of causing the bowel to give a resonant percussion note. Ordinary air has been injected, but carbonic acid gas liberated by chemical reaction in the bowel itself is the best and most manageable method. Half an ounce of bicarbonate of soda, and three drachms of tartaric acid are dissolved separately in water, four or five fluidounces for each solution. The soda solution is then injected as high as possible into the rectum by means of the long tube ; the acid solution is then injected in several portions, allowing three or four minutes' interval between each. During the injection and afterwards the anus requires to be energetically compressed. As soon as the injection is finished, the large intestine can be easily recognized by means of sight, touch, and percussion.

Vaginal examination may show the lower part of the cyst to be resting on the pelvic inlet, whether we have to do with a renal or ovarian affection. In the case of a renal cyst both ovaries will be felt *in situ ;* both ovaries may equally be felt in the case of a parovarian cyst. The position of the uterus is of more importance ; in hydronephrosis the position will be unaltered, or the womb simply pushed somewhat downward. Where there is an ovarian cyst the uterus is generally found altered in position ; most frequently the fundus is turned backward ; often it is pulled upward to some extent at the same time. These alterations in position are to be made out by vaginal and rectal digital examination, and by the use of the sound. Where the fundus is turned forward, as it is in 30 to 40 per cent. of ovarian tumors, the position has no importance as regards diagnosis between ovarian and other cysts. The most important result of vaginal examination is the recognition of a pedicle coming from one cornu or other of the uterus in the case of an ovarian cyst. The search for this may be facilitated where necessary by causing an assistant to draw down the uterus by means of a vulsellum fixing the cervix, while digital examination through the rectum is carried out, an anæsthetic being administered if necessary.

Exploratory puncture has been recommended, but it is to be condemned because, in the first place, it is at least as dangerous as exploratory laparotomy, and in the second, it is frequently useless. Thus, in a case of Hilton Fagge's, which was shown to Morris, a cyst supposed to be hydronephrotic contained limpid opalescent fluid, of specific gravity 1004, which contained no albumen, sugar, urea, or uric acid; it did contain a small proportion of sodium salts. After tapping, a round, hard substance was felt in the left loin. No mention is made of vaginal examination. Similar fluid has been found in other cases of hydronephrosis, and in congenital cases, but exactly similar reactions characterize the contents of parovarian cysts. Where a large percentage of urea is present in the aspirated liquid the great probability of a renal cyst is clear enough; but, on the other hand, not only may urea completely fail, but mucin and paralbumen are sometimes present in the fluid from a hydronephrosis. Uric acid has never been found in ovarian fluids, and so the murexide test might prove of value in some cases. But practically the examination of the fluid is, in the majority of instances, inconclusive, and sometimes it is actually misleading.

As a corollary to exploratory puncture Simon has proposed to sound the cavity of the cyst, but this procedure would be of more than doubtful utility.

The examination of the urine is also, as a rule, of no importance in diagnosis, but there is one precaution which should never be neglected, and to which attention may here be specially directed. In every case where albumen or other abnormal constituent is found in the urine of a female, the examination ought to be repeated on a specimen obtained by the catheter. By this means contamination with vulvar and vaginal discharges is avoided, and in addition it may occasionally be observed that what is supposed to be urine does not come from the bladder and urethra at all, but is in reality another sort of discharge and is escaping from the vagina. A case in point is related by Barnes:[1] A woman waiting to be tapped for ovarian cyst began to pass large quantities of urine, and her distress subsided. The fluid passed was albuminized serum, with cholesterine plates. The woman died six months later from hæmoptysis; the tumor was a tubo-ovarian cyst, and the fluid had all passed along one of the Fallopian tubes into the uterus and vagina, and so externally. Nevertheless, this fluid had all along been supposed to be urinary. Cystoscopy with catheterization of the ureters may occasionally be useful by showing that all the urine is escaping from one ureter.

Occasionally important help to diagnosis may be obtained from the history of a patient. It has been shown that the occurrence of attacks of diuresis with disappearance, more or less complete, of the tumor is of no importance. If after these attacks, however, the remains of the swelling are found in the lower abdomen or in one of the loins, this, especially if noted by a trained observer, will possess some weight. If the tumor definitely began in one lumbar region, or if its growth was preceded by attacks of renal colic, or by continued pain in one loin, the diagnosis of renal cyst is probable. If the tumor has begun in childhood and very slowly increased in size, ovarian cyst is very improbable, and hydronephrosis very likely.

I am indebted to my colleague, Dr. Saundby, for the opportunity of examining a second case of abdominal cyst, which was characterized by repeated intermissions, attended by copious diuresis. By his kind permission, for which I am glad to take this opportunity to thank him, I am enabled to incorporate in this paper the notes of the case.

CASE II.—*Abdominal Swelling Thirteen Years; Repeated Subsidences varying in Completeness, associated with Diuresis; Clinical Diagnosis of Ovarian Cyst.*—C. T., married, aged fifty-six years, was admitted to the General Hospital, Birmingham, under the care of Dr. Saundby, on May 27, 1896, complaining of periodical swelling of the abdomen. There had been no serious illness apart from the present one;

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[1] Diseases of Women, 1878, Second Edition, p. 331.

the patient had had five children, the last fifteen years ago; the last labor was difficult, and terminated by forceps. There is nothing of importance in the family history. The present affection began thirteen years ago with sharp pain in the lower abdomen in the middle line; there was no obvious cause, and the patient was not straining or lifting at the time. Five or six months afterwards the lower abdomen commenced to swell in the middle, and reached a maximum in about four months; the swelling then seemed to vary in size for a month, after which it subsided in about a week. The increase in size has occurred and disappeared in a similar way at intervals ever since. At first this happened about once in a twelvemonth; now it comes on two or three times in the same period. The tumor is quite painless during the early part of development, but becomes painful as distention goes on. When the abdomen is "big," the woman has to pass water two or three times in an hour; as the swelling begins to subside, a large quantity of pale urine is passed, but the frequency of micturition is less. The process of diminution usually lasts about a week. Sometimes the swelling only partially subsides; sometimes the abdomen goes quite flat, and then the patient says she can feel a hard lump in the middle of the lowest part of the abdomen. When the distention is greatest the legs swell, and the patient has to keep her bed. The present swelling began three months ago. Menstruation, which was always regular, with intervals of about three weeks, ceased ten years ago, and there has been no vaginal discharge of any kind since. The bowels have always been constipated.

The patient is a thin, somewhat emaciated woman, looking quite her age. The abdomen is very prominent, of a rounded form; there are no dilated superficial veins; lineæ gravidarum are moderately marked. There is a decided tenderness all over the swelling, especially on the left and lower parts. A rather soft, elastic tumor fills the lower abdomen and extends above the umbilicus; the edges are indistinct. The distance between the umbilicus and the anterior superior iliac spine is half an inch greater on the left side than on the right. The distance of the umbilicus from the pubes is eleven inches; from the lower end of the sternum seven inches. The greatest circumference of the abdomen is below the umbilicus and measures thirty-eight and a half inches. There is dulness on percussion all over the central portion of the abdomen, and surrounding this a belt of resonance, except at the lower part above the pubes, where there is also dulness. The area of dulness is not altered with change of the patient's position. Free fluctuation can be obtained from any one point of the tumor to any other. Vaginal examination shows that the uterus is somewhat displaced upward, with the fundus behind the lower portion of the abdominal swelling, which is felt as an undefined resistance above, not depressing the anterior vaginal wall.

The liver cannot be felt; dulness extends in the right nipple line upward to the fifth intercostal space, and downward to join the dulness over the swelling. The spleen is not enlarged. There are no abnormal signs in the chest. The patient complains of a little pain after meals, and there is constipation.

The urine was carefully examined from May 28 to June 4; the quantity measured varied from twenty-six to sixty-six ounces in the twenty-four hours; the specimen examined was, on three or four occasions, slightly alkaline, and usually showed a faint haze of albumen. The amounts of urea on three succeeding days were 232, 372, and 424 grains respectively. From May 29 to June 1, inclusive, there was slight febrile reaction; the highest temperature, 101.4° F., being reached on the first-named date.

I saw this patient on May 30, and confirmed all the signs above described. The catheter was passed, and the bladder was found to be below the base of the tumor, with its upper and lower walls in contact, and the lateral portions apparently equal in size and extent; the viscus did not extend upward behind the pubes and in front of the tumor.

Operation for removal of the cyst was recommended, but refused by the patient, and she was discharged on June 6 in the same condition as on admission.

The diagnosis of ovarian cyst was based in this case on the absence of signs of intestine in front of the cyst, the evidence afforded by percussion, and the fact that the uterus was retroverted and drawn somewhat upward.

Measurement showed that the swelling only affected the lower part of the abdominal cavity, and that it was nearly symmetrical, and the woman was clear in stating that, when the swelling disappeared as far as it ever did, there was a firm lump still left in the middle of the lowest part of the abdomen.

In conclusion, it may, perhaps, be desirable to sum up my own conclusions as to what should be done in a case of doubtful diagnosis. In the first place, all care and diligence should be directed to the examination of the case, the points of chief importance being the relation of the large intestine to the cyst, the relation of the cyst to the loins, and the presence or absence of a pedicle connecting it with the uterus. If the diagnosis cannot be made clearly, operation should be recommended and commenced with an exploratory incision four inches long, placed as low as can safely be done in the median line. Through this the hand can be passed and the relation of the cyst to the uterus and ovaries made out; if the cyst be very tense, an aspirator needle may be employed to draw off some of the fluid in order to facilitate examination, the holes made can be closed afterwards, if necessary. Through the exploratory incision the relation of large intestine to the front of the cyst can also be made out if required. If the case turn out to be ovarian, ovariotomy is now proceeded with in the usual way. In hydronephrosis the exploratory opening is closed and an incision into the cyst made in the lumbar region. If the tumor is not ovarian and still not certainly renal, an incision may be made into it, and the renal pelvis felt for. This is described by Simon as marked in large cysts by shallow, circular, or crescentic depressions, lined by mucous membrane and limited by prominent edges; the depressions are fairly rounded and have a diameter of one and a half to two centimetres and over, their inlets are narrower than their bases. They are placed on the posterior surface of the cyst at distances apart of three to four centimetres. If the pelvis of the kidney be recognized, a counter-opening should be made in the loin and a large drainage-tube introduced. The anterior opening in the cyst wall should then be closed with two superposed layers of catgut suture, the inner continuous and embracing the whole thickness of the cyst wall; the outer interrupted layer placed like Lembert's intestinal suture embracing the peritoneum only. The anterior abdominal wall should then be closed.

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CLINICAL CONTRIBUTION TO THE SURGERY OF THE LIVER.

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CASE I.—*Liver Abscess; Hepatotomy; Recovery.*—J. S., aged thirty-eight years, laborer, was admitted into the British Hospital on October 15, 1892. For the previous six weeks he had suffered from nocturnal fever, occasional shivering fits, loss of flesh, sweats, and a constant pain in right subcostal region, with occasional stabbing pain near inferior angle of scapula. On examination, a slight fulness was visible below right costal recession; on palpation there was marked tenderness, with fluctuation, and downward inspiratory movement, and, on percussion, there was absolute dulness. Temperature on evening of admission was 102.6° F. Tongue furred, much thirst, and profuse perspiration.

On the following morning chloroform was administered, and a two-inch incision made over swelling. On opening the peritoneum, as the liver was found adherent, a director was pushed into liver-substance, at a depth of one-fourth of an inch an abscess was struck, and pus escaped along the groove; the opening was further enlarged by Hilton's method, and two pints of grumous pus evacuated; a large drainage-tube was then inserted and cavity irrigated with warm Condy's lotion. By the third evening constitutional symptoms had disappeared, and he was discharged cured on the forty-first day. He has frequently reported himself during the past four years and remains in normal health.

He had suffered from enteric fever and dysentery in 1891. No history of malaria.

CASE II.—*Liver Abscess; Empyema; Transthoracic Hepatotomy; Death.*—G. U., aged twenty-one years, mechanic, was admitted into hospital on August 10, 1893, complaining of cough, dyspnœa, and severe pain in right side of thorax. Past history excellent, excepting enteric fever in 1892. Three weeks before admission he had to stop work, owing to pain, rigors, sweats, and fever; a week later he developed a most incessant cough, accompanied by a large quantity of offensive sputum.

Examination after admission: Patient had a very anxious look; he was bathed in perspiration: tongue furred and dry; temperature 103.4° F.; pulse 120; respiration 40; constant cough, with most fetid expectoration; he lay on his right side, and the least movement caused alarming dyspnœa. The right side of the thorax did not expand on inspiration, and intercostal fulness was visible from third rib downward. There was absolute dulness extending anteriorly from the third costal cartilage to the umbilicus, and in the axillary line almost to the level of the iliac crest. On auscultation there was absence of breath-sounds below the third space. Bronchophony and pectoriloquy were well marked. Patient complained very much of tenderness on percussion, and there was absence of tactile fremitus. The liver was felt enlarged down to level of intertubercular plane, but no fluctuation could be detected below ribs. During the following twenty-four hours he had several rigors, and temperature, evening of admission, was 105.4° F.

On the 12th of August an aspirating needle was inserted into the right pleural cavity, and a few drachms of chocolate-colored pus drawn off. Chloroform was immediately given; three and a half inches of sixth rib were excised in axillary line, and about four pints of the most horrible-smelling pus evacuated from the pleural cavity. The diaphragm was found pushed upward by a tense fluctuating swelling; a careful search was made for an opening in it, but none found. The diaphragmatic pleura and diaphragm were next incised, and as the liver was found adherent a large curved trocar was inserted, and six pints of grumous pus removed. A large drainage-tube was placed in the hepatic cavity, and no sutures were introduced into external wound. First evening, temperature 101.2° F.; breathing greatly relieved; cough considerably diminished.

After this the abscess cavity was irrigated twice daily, and by the tenth day all symptoms of septicæmia had vanished; temperature remained normal; no pus from cavity in liver, and only a slight serous discharge from pleura; cough and expectoration ceased; there was nothing to record for the following twenty days. Patient ate well, rapidly gained weight and strength, and was allowed out of bed.

On September 10 temperature went suddenly up to 102.5° F.; a large leaden probe was immediately passed into liver sinus; it was found patent, contained no pus, and had contracted considerably. The probe was then moved freely about in pleural cavity, some adhesions were broken down, but nothing was found to account for temperature. During the night patient had a rigor, and on the following morning, as the temperature was 100° F., the same searching process was repeated, an aspirating needle was inserted into liver at five different spots, but no pus was struck.

On September 12 about a tablespoonful of pus was noticed in dressings; the pleural cavity was again examined and aspirating needle again made use of; but all in vain. Constitutional symptoms gradually returned, a few drachms of pus were noted on each dressing, many searches were made, but septicæmia ended what at one time appeared to be a most promising case on the 20th of October.

Post Mortem.—A healthy granulating sinus was found passing obliquely downward from the upper border to the centre of liver-substance; this was all that remained of the large cavity out of which six pints of pus were evacuated. Three inches internal to this sinus a small abscess was found containing two ounces of pus; this was quite superficially located in upper border of liver, beneath the sixth chondrosternal articulation; from this a small sinus passed through diaphragm and opened into anterior mediastinum, where a localized collection of some three ounces of pus was found; this in turn communicated, by a small opening about the diameter of a cedar pencil, with the right pleural cavity, and around this aperture a few drops of pus were seen. There was no trace of any communication between the small abscess cavity and the healthy granulating sinus.

The circuitous manner in which the small liver abscess communicated with the pleural cavity is instructive, and, moreover, this case only too plainly demonstrates the fact that, even after successfully striking an enormous hepatic abscess, a satellite abscess much more deadly may be in existence. Another point worthy of note is the unreliability of an aspirating needle in searching for small abscesses; indeed, in such a case the moral is obvious; if the needle fails, don't let the patient die without having resort to a knife and bone-forceps.

CASE III.—*Liver Abscess; Transthoracic Hepatotomy; Recovery.*—S. J., aged thirty-seven years, sailor, was admitted on June 2, 1893, complaining of pain in abdomen, diarrhœa, and fever. Ten days before admission he stated that he was suddenly seized with cramps and diarrhœa, unaccompanied by rigors or sweats. History of dysentery ten years ago; never had malaria or enteric fever. On admission temperature was 100.6° F.; tongue furred in centre; the patient complained of headache, pains in back and legs; there was marked gurgling and tenderness all over the abdomen; no rose spots; no enlargement of liver and spleen; other organs were normal. With these symptoms and the history of onset the enteric fever was diagnosed, and the patient was placed on the usual milk diet, and a mixture of quinine and chlorine ordered.

During the following four weeks nothing occurred to alter the diagnosis. Temperature ranged from 100° F. in the morning to 103° F. at night; no sweats or rigors; the diarrhœa which he had for some days after admission ceased and was succeeded by constipation. The liver and spleen were percussed and palpated twice weekly, but no enlargement or particular tenderness was noted. On July 1 the night nurse reported that the patient perspired profusely during the night, and, as the nocturnal temperature did not show any tendency to diminish, tubercular ulceration of intestines was suspected. The night-sweats continued during the month of July, the lungs were frequently examined, but nothing abnormal found. On July 28 he for the first time complained of a dull pain in right scapular region, as the pain was increased on deep inspiration, pleurisy (tubercular) was suspected; but on examination no evidence of it could be elicited, nor could any appreciable enlargement of liver be detected. On August 14 he was extremely despondent, very emaciated, tongue like a raw beefsteak, sweating continuously; a short hacking cough had been noticed for a few days; and, on examination at this date, marked tenderness was for the first time noted in the ninth intercostal space a little in front of axillary line. At last it dawned on me to explore the liver; a long, hypodermic needle was inserted at the tender spot, and, indeed, it had not to travel far until I found it free in a cavity, and a few drops of grumous pus were withdrawn. The needle was left *in situ*, and then and there I entered a straight, sharp-pointed bistoury along-side of the needle into the abscess cavity; the needle was withdrawn and a closed sinus-forceps was pushed along the blade of the knife, when the end of the forceps was felt free in the cavity, the knife was withdrawn, the blades of forceps forcibly dilated, and eight ounces of pus evacuated ; a medium-sized drainage-tube was then passed into the abscess cavity and the latter irrigated with warm Condy's fluid until this returned clear. A rapid convalescence ensued, and he was discharged cured on September 28. A month later he reported himself as fit to resume his work as boatswain.

The manner in which this abscess was opened may appear somewhat rash, but the patient was in such a low state that it was questionable if he would survive an anæsthetic. Anyhow, my feelings can be better imagined than described when I saw pus in the hypodermic syringe, for through my faulty powers of diagnosis a fine fellow was kept ten weeks in hospital, treated for typhoid, suspected of tubercle, and reduced to a skeleton. In excuse it may be said that without rigors and no perceptible increase in liver dulness abscess was unlikely. Yet I confess I did not pay as much attention as I should have to the pain, and as hepatic abscess was not suspected I did not make any careful searches for a tender spot in the right intercostal spaces. This case was a lesson to me, and I hope it will be a guide to others, particularly in a country like this where enteric fever is practically endemic.

CASE IV.—*Liver Abscess; Hepatotomy; Recovery.*—P. B., aged forty years, laborer, admitted April 13, 1894, suffering from an ill-defined, tender, fluctuating swelling in right hypochondrium. About four weeks before he noticed some pain in this region, gradually lost flesh, had occasional fever, and some shivering fits. On admission temperature was 101.8° F. ; tongue furred ; pulse 100 ; on percussion the dulness over swelling was continuous with that of the liver, and with inspiration downward movement was distinctly felt.

Chloroform was administered on the following morning, and assisted by my colleague, Dr. Shadbolt, a two-inch vertical incision was made over site of maximum bulging, as the liver was found adherent to parietal peritoneum, a closed sinus-forceps was inserted, blades dilated, and twenty-four ounces of pus evacuated ; a large drainage-tube was introduced and cavity irrigated with Condy. He was discharged cured on May 11, and has continued since in good health. History of dysentery four years before.

CASE V.—*Hydatid Cyst of Liver; Cœliotomy; Recovery.*—J. D., school-boy, aged ten years, was admitted on December 3, 1894, suffering from an enormous hydatid cyst of liver, which occupied almost the whole abdominal cavity. The size of the tumor was very graphically described by the head surgical nurse, who said, "You cannot see his face if you stand a few feet from the end of the bed." The boy was emaciated; apex-beat displaced upward; respirations altogether thoracic and hurried; pulse small and weak; temperature and urine normal. On percussing the abdomen no tympanitic note could be found; fluctuation was very distinct, and the abdomen was greatly distended; in fact, he was all belly.

On December 5 chloroform was very cautiously administered, and a three-inch incision was made in the right semilunar line; as no adhesions existed between cyst and parietal peritoneum a medium-sized trocar was inserted and ten pints of clear hydatid fluid removed. Marsupialization having been performed in the usual manner, the cavity was irrigated and the largest endocyst I have ever seen evacuated. No untoward symptoms appeared until the fourteenth day, when he developed a sharp attack of measles; a fortnight later some bile was noticed in the dressings; this gradually increased in quantity until three or four ounces *per diem* were passed; after a month the biliary fistula closed. He now rapidly began to pick up, and was discharged cured on the sixty-sixth day. His mother quite recently reported that the lad was in excellent health.

I wish to call particular attention to the dangerous and useless practice adopted by some surgeons of introducing sutures through parietes and cyst wall before the latter is at any rate partially emptied.

The cyst walls are so extremely thin and tense that it is futile to attempt inserting fixation-sutures without entering the cyst cavity. In the above case I attempted this manœuvre, with the result that at each needle puncture a continuous jet of fluid took place. Unfortunately I was unprepared for the mishap, and before I could help myself some fluid had entered the peritoneal cavity. Luckily no bad results followed. The tension inside these cysts is so great that liquid will escape through the puncture of even the finest needle. In two of my cases in which hydatid toxæmia followed aspiration there can be no doubt that it was not the presence of the needle in cyst that caused it, but the escape of hydatid fluid through the puncture-hole into a serous cavity, where I presume the poison was elaborated and rapidly absorbed into the system. I have never yet introduced into an hydatid cyst in an open wound a trocar, hook, or needle without seeing an escape of fluid; this is bad enough in a patent incision, but infinitely worse in a diagnostic puncture or tapping. I always empty such cysts through a medium-sized aspirating trocar and canula, taking care before doing so to have the peritoneal cavity well shut off with sponges; when the tension is relieved the cyst is seized by hooks, drawn to the surface, the trocar opening enlarged, the sponges removed, and the cyst fixed to parietal wound by sutures. In carrying out the last step of the operation the parietal peritoneum is ignored, except at the upper and lower angles, my object being to bring about union between cyst wall and the broad fibrous surfaces of the incision.

CASE VI.—*Hydatid Tumor of Liver; Transthoracic Operation; Recovery.*—A. D., aged twenty-five years, married woman, was admitted on February 3, 1895. Patient was kindly transferred to my care by my colleague, Dr. Petty, with the diagnosis of a large hydatid tumor having its origin in upper part of liver. Examination: Temperature and pulse normal; respiration hurried on exertion; slight cough without sputum; the patient complained of a dull pain in the right side of chest, which she had noticed gradually increasing for the past six months. On percussion there was dulness extending from the lower border of second right costal cartilage to subcostal plane. In the axillary line the dull area was about the same in extent. No air could be heard entering the right lung anteriorly, but posteriorly breath-sounds were distinctly audible.

On February 5, assisted by my colleagues, Drs. Shadbolt, Petty, and Cruikshank, an aspirating needle was inserted in fourth intercostal space, a little in front of axillary line, and a few drops of clear liquid drawn off. Chloroform was at once administered and three inches of fourth rib resected. When the costal pleura was opened the diaphragm was found pushed considerably upward, and on palpation a tense cyst was felt beneath it. The diaphragmatic pleura and diaphragm were then incised for about two inches, and a white, non-adherent cyst presented. A medium-sized curved trocar was inserted into the cyst, and about five pints of clear hydatid fluid drawn off. When the walls of the cyst were sufficiently lax the edges of the trocar-opening were seized by two sharp hooks and the presenting portion of cyst wall drawn through diaphragm and sutured to parietal wound. A large drainage-tube was inserted and cavity irrigated with Condy's, but no endocyst appeared. The remaining portion of the external incision was closed by interrupted silk sutures.

There is nothing to record in the convalescence excepting a nightly rise of temperature, and the dressings had to be changed three times daily as suppuration was profuse. March 28, during irrigation, the collapsed endocyst appeared, and was delivered by the aid of a pair of pressure-forceps. After this the cavity rapidly contracted, and the patient left the hospital cured five weeks later. During the past eighteen months she has frequently reported herself, and I am glad to be able to state that her right thorax appears in every respect normal.

This case afforded me a valuable hint, for I have since noted, if the endocyst is not removed at once profuse suppuration ensues, with marked constitutional symptoms, and these continue until it is expelled. Acting on this I always continue the primary irrigation until the collapsed cyst is evacuated; seizing it with forceps is unsatisfactory, for it is so friable that it frequently breaks off; the best method is to attach a long Jacques catheter to nozzle of irrigator, pass it deeply into the cavity ; immediately the quivering mass is forced by the pressure of lotion into the wound, and can easily be extracted by a pair of fingers. By this means subsequent suppuration and hectic are appreciably diminished.

CASE VII.—*Hydatid Tumor of Liver; Abdominal Section; Recovery.*—F. P., aged twenty-nine years, married woman, was admitted February 27, 1895. Patient was kindly sent to me by my friend, Dr. Robert Greene, with the diagnosis of a large, hydatid cyst of liver, occupying almost the whole of right half of abdominal cavity.

On March 1, assisted by my friends, Drs. Shadbolt, Arthur Greene, and Cruikshank, a three-inch vertical incision was made in right semilunar line; as no adhesion existed with parietal peritoneum, the abdominal cavity was shut off with sponges, a trocar was then inserted into the cyst and about eight pints of clear, hydatid fluid drawn off. The opening into the cyst was next enlarged sufficiently to admit the hand, the endocyst was removed, cavity irrigated with warm 1 in 2000 corrosive sublimate, the interior of cyst was then carefully dried with sponges and some iodoform dusted in. The opening in the cyst was closed by a continuous silk suture and the mass was returned into peritoneal cavity; finally, the external wound was closed by three continuous silk sutures. Patient felt greatly relieved, highest temperature recorded was 99.6° F. on second evening, the wound healed by first intention and the skin sutures were removed on the tenth day.

Fifteenth day temperature went suddenly up to 101.3° F.; the abdomen was carefully examined but nothing abnormal noted. Sixteenth day nocturnal temperature 101.6° F. Tongue slightly coated; no abdominal symptoms. Twenty-first day a profuse nettle-rash appeared, which caused patient considerable discomfort; notwithstanding a strict milk diet, and a liberal allowance of alkalies and magnesia, this continued going and coming. Thirty-second day she complained of a slight pain in site of incision, and on examination a faint fulness was detected at margin of right costal curvature. A hypodermic needle was inserted, and a few drops of pus withdrawn. Chloroform was at once administered and a two-inch incision made over puncture; on opening the peritoneum an abscess was suddenly struck; luckily dense adhesions had formed, and the peritoneal cavity was firmly shut off, about one pint of pus was evacuated, and the abscess cavity proved to be the returned cyst. A large drainage-tube was inserted and cavity irrigated. Six days later the baneful urticaria disappeared, an uninterrupted convalescence ensued, and the patient was discharged cured on May 6.

In September, 1896, she sent word that she was quite well.

This case was particularly interesting to me, as it was the first occasion on which I practised Bond's operation, and, as far as I see, I am not likely to repeat it; of course, the advocates of this method may justly say that it is absurd to judge it by one case, and that my technique was faulty. While most willingly admitting the force of such objections, I must say that as marsupialization is such a safe procedure, and as the achievement of complete asepsis occasionally baffles even the ingenuity of the most painstaking surgeons, I do not think the game is worth the candle. At the same time I do not consider marsupialization by any means a utopian performance, for it entails a long convalescence, and frequently the patient is much debilitated before the cavity is finally closed. I think it would facilitate matters greatly if we would make large parietal incisions, in order to thoroughly expose the cyst; by so doing I feel confident that in the majority of these cases it would be an easy matter to remove a large portion of its wall, and suture the remainder, if necessary, in folds to external wound. The prolonged attack of urticaria was very puzzling, for at the time I was not cognizant that there was such a thing as hydatid toxic poisoning, much less that nettle-rash was a symptom of it; for this knowledge I am indebted to a recent epitome of the *British Medical Journal*. In this case it is worthy of note that this toxic symptom did not appear until the twenty-first day after operation, and I presume, as there was an elevation of temperature on the fifteenth day, suppuration had already commenced in the cavity of the cyst.

CASE VIII.—*Hydatid Tumor of Liver; Hepatotomy; Death.*—Mrs. G., aged fifty-one years, married, admitted July 22, 1895. Patient was kindly sent to me by my friend Dr. Dodds, with the diagnosis of hydatid of liver. Previous to this another colleague had made an exploratory puncture in ninth intercostal space, in the axillary line, and drawn off a small quantity of hydatid fluid. On examination, the liver was felt enlarged downward to level of umbilicus; this enlargement occupied part of epigastrium, whole of right hypochondrium, and a portion of right lumbar region; deep fluctuation was detected, but it was evident some liver-substance intervened between cyst and abdominal wall.

On July 29, assisted by my colleagues, Drs. Shadbolt and Cruikshank, a three-inch vertical incision was made slightly external to right semilunar line; on opening the peritoneum liver-substance presented, and as no adhesion was present the general cavity was shut off with sponges. An aspirating trocar and canula was inserted into liver and at an inch in depth the cyst was struck. On withdrawing the trocar some clear fluid escaped, the trocar was immediately replaced in the canula, as I did not want the cyst to collapse until I was in a position to secure it. A blunt-pointed bistoury was then passed down along-side of trocar and a one-half inch incision made through whole depth of intervening liver-tissue, profuse hæmorrhage at once occurred, the knife was withdrawn, sponge-pressure applied, and the bleeding ceased. A sinus-forceps was next inserted, the blades were gently dilated, and in a moment the whole field of operation was a sea of blood ; as sponge-packing failed, sutures were inserted through parietes deeply into liver-substance, and sponge-pressure again resorted to, unfortunately, with the pressure made the sutures cut out. As blood escaped in a most appalling manner, my only hope seemed to make for the cyst at all hazards, open it, and drag it forward. The right index-finger was bored along canula through liver-substance and blood, when the cyst was felt at tip of finger ; it was seized with a tenaculum and opened with a blunt-pointed scissors ; in the rush of hydatid fluid and blood, I luckily managed to grasp the cut edges of cyst with two large pressure-forceps, forward traction was at once made, and the hæmorrhage ceased. My assistant kept a firm hold while I introduced six silk sutures through parietal wall, liver, and cyst, the forceps were then removed and no more bleeding occurred. Having irrigated the cyst cavity with warm Condy and removed the endocyst I introduced a large drainage-tube and applied the usual dressings.

The patient greatly collapsed, cold, and pulseless, was rapidly removed to a warm bed. Rectal injections of hot water, coffee, and brandy were given every three hours, four drops of strychnine injected every four hours, and six hours after operation small quantities of brandy and soda were given by mouth.

By the next morning the patient had somewhat rallied, but despite all our efforts the shock continued and she died on the following day. No post mortem was obtained.

Never have I had a case that has given me such food for painful reflection, and I consider it a duty to publish it and state what I consider were my mistakes. Undoubtedly the first was the introduction of a knife to cut through an inch of healthy liver-substance. Even after this the situation might have been saved, as sponge-pressure was effective, by merely emptying cyst through canula and closing the external wound, thus trusting to tapping to cure the trouble. The second and most lamentable error was attempting to make an opening in the liver by dilating the blades of sinus-forceps,—the knife cut through, but these tore through, which was infinitely worse. After this no ground remained on which to retrace my steps, and as the hæmorrhage had to be stopped my finger was the only weapon left with which to lead such a forlorn hope.

In the *Lancet* of September 12, 1896, I read with interest a case of transthoracic hepatotomy, published by two well-known medical men, and I was particularly struck by the following paragraph: "Except in abscesses which are unusually deeply seated, the simple method of pushing a knife into it along-side an ordinary trocar left in position to act as guide and following this up with dressing-forceps to dilate the opening ('an inch in depth') sufficiently to introduce a finger appears to be a perfectly safe procedure." After my above experience, I am not certain whether I envy or pity the surgeon who has the courage to advance such an opinion, evidently from the experience of one lucky case.

In hepatic abscesses superficially located, the presenting liver-substance is often merely a thin pyogenic wall; in such cases, dressing-forceps are harmless, but I look on a knife and dressings-forceps as only suitable for opening healthy liver tissue in such operations as may be practised in the mortuary. If it ever falls to my lot again to encounter an inch of healthy liver tissue on the road to an abscess or hydatid, I shall most certainly do the operation in two stages. It is absolutely essential to have a firm basis in order to arrest hæmorrhage by sponge- or gauze-packing, but such methods of hæmostasis are futile in a receding torn liver. Sutures cannot be relied on, for they easily tear out if firm pressure is made; consequently, the only hope is to have firm adhesion with the parietal wound, then, if severe hæmorrhage occurs, we have something to press against. The second stage should be carried out with a cautery, using a fine trocar as a guide.

CASE IX.—*Liver Abscess; Transthoracic Hepatotomy; Recovery.*—G. E. H., aged thirty-six years, campman, was admitted into hospital on August 1, 1895, complaining of loss of flesh, sweating, shivering fits, fever, increasing debility, a constant throbbing pain in upper portion of right hypochondrium and right scapular region, and an occasional hacking cough. On examination temperature was 103.6° F., pulse 90, respiration 28, and tongue furred and dry. On percussion liver-dulness was found, increasing upward to upper border of fourth rib; there was marked tenderness in fifth, sixth, and seventh intercostal spaces, the slightest touch causing him to wince. The lungs were normal, and a slight friction sound was audible in the lower intercostal spaces. Liver abscess being suspected, a long hypodermic needle was inserted in sixth space midway between nipple and axillary lines, and a few drops of grumous pus drawn off. Chloroform was administered, and assisted by my colleagues, Drs. Shadbolt and Cruikshank, two and a half inches of sixth rib were resected in site of puncture. The costal diaphragmatic pleuræ and diaphragm were incised, and as the liver capsule was found adherent to diaphragm the two layers of pleura and diaphragm were coaptated by a continuous circular silk suture. When the costal pleura was opened air rushed in, but the chloroformist stated that the patient's breathing was in no way embarrassed by it. The liver having been thus exposed, an aspirating needle was inserted, and at one-quarter inch in depth an abscess was encountered; the part was then seized by a pair of sharp hooks, and with a blunt dissector an opening sufficiently large to admit finger was made, and some three and a half pints of pus evacuated; a large drainage-tube was introduced and cavity irrigated.

By the twelfth day constitutional symptoms had disappeared, the cavity had greatly contracted, and purulent discharge had ceased. A few days later some bile was noticed on the dressings, this gradually increased in quantity, and for three weeks some four ounces of this fluid daily escaped. This complication retarded patient's progress; he remained very thin and weak and was greatly troubled with an eczematous condition of skin around wound. The fistula did not finally close until September 25, and during the following week a marked improvement followed; he immediately gained weight and strength and was discharged cured on October 4. He reported himself in person ten months later, and was in excellent health. No previous history of dysentery, enteric fever, or malaria.

Some authorities recommend enclosing a circle of both layers of pleura, diaphragm, and liver by passing sutures before opening costal pleura. One of the advantages claimed is that little or no air enters pleural cavity. One surgeon who recently practised this method writes: "Another advantage of not incising the pleura until after the sutures have been introduced is that very little air enters the chest, and complete and sudden collapse of lung is thus prevented, a matter of some importance with the patient under the influence of an anæsthetic." Theoretically this sounds all right, but his own attempt is particularly interesting. "In our own case, air was sucked into the chest through a small accidental opening into the pleura, as well as each time the pleura was punctured in the act of introducing sutures." The doctor "who administered the anæsthetic was unable to observe that this produced any effect upon the respiration. The same observation has been made when the pleura has been wounded in the act of removing a cervical rib." From his own statement and the observation of his chloroformist, I fail to see where the great advantage lies. In my opinion the introduction of sutures into a non-adherent suppurating liver is fraught with danger, for, if the abscess should be superficially located, an escape of pus may take place into the peritoneal cavity through the needle-punctures before the part is exposed. It is hardly necessary to mention that the portion of liver intervening between the abscess and the peritoneal cavity is often merely a pyogenic wall, and most probably the tension of sutures would be quite sufficient to enlarge needle-holes, and thus afford one or more outlets for pus. Again, if firm adhesions have previously taken place between liver and diaphragm, the insertion of sutures into this part is altogether superfluous, as well as unnecessary, and their application only wastes valuable time. Because a method is associated with the name of a very distinguished surgical authority, I do not see why its advantage should be blindly accepted, particularly so since it is at variance with a tenet of every-day surgery,—"see what you are doing."

Another suggestion made, which I cannot omit referring to, in regard to the treatment of hepatic abscesses, is to insert a needle, draw off some pus, submit it to a bacteriological examination, and if the pus is sterile, delay operation for forty-eight hours. As against the adoption of such a routine I wish to most clearly emphasize that, in my opinion, no form of exploring needle should be employed unless real doubts exist as to the nature of the case, for I consider such an instrument a most dangerous weapon, and no surgeon should ever insert it into any abdominal swelling unless his chloroformist, assistants, and instruments are at hand; if pus is struck, it should be then and there evacuated by an open incision.

CASE X.—*Suppurating Hydatid of Liver; Abdominal Section; Recovery.*—J. F., aged twenty-eight years, station-master, was admitted September 4, 1895. For the previous ten months patient complained of stomach trouble, and he was treated all that time for dilatation of that organ. On admission a distinct swelling was visible in the epigastrium, and on palpation, fluctuation and downward inspiratory movement were readily elicited; examination was unattended with tenderness. Temperature, pulse, respiration, and other organs normal. No history of rigors, fever, pain, or sweats.

On September 12, assisted by my colleagues, Drs. Shadbolt and Cruikshank, a three-inch vertical incision was made in median line midway between the xiphoid and umbilicus. When the peritoneal cavity was opened a non-adherent hydatid cyst presented. Sponges having been applied in the usual way, a medium-sized trocar was inserted into the cyst and about two pints of yellowish pus evacuated. The trocar-opening was seized by two sharp hooks, the cyst drawn forward with blunt-pointed scissors, the opening was enlarged, the cavity was then irrigated, and a collapsed necrosing endocyst removed. Marsupialization was effected by a continuous silk suture and a large drainage-tube inserted. An uninterrupted convalescence ensued and patient was discharged cured on the forty-sixth day.

This is the only case of primary suppurating hydatid cyst that I have met with, and it is worthy of note that no constitutional symptoms accompanied the suppuration, although from the gangrenous appearance of the endocyst it must have been going on for a considerable period before operation.

CASE XI.—*Hæmatoma of Liver; Hepatotomy; Recovery.*—A. K., aged twenty-seven years, shepherd, admitted on July 24, 1896, with the following history: Eight months ago he received a "puck" from a bull in right hypochondrium, severe pain followed which necessitated his remaining in bed for seven days, after this he felt all right and resumed work. A month later the pain returned, and he for the first time noticed a slight swelling to inner side of costal arch (right); after another week's rest in bed these symptoms disappeared, and he returned to mind his sheep, which, by the way, entailed being in the saddle from sunrise to sunset. During the ensuing six months he felt perfectly well, but about the middle of June, 1896, the pain and swelling reappeared, and as a few days' rest failed to relieve him, he came to Buenos Ayres and entered the British Hospital. Examination: Patient's general condition was normal, and he only complained of pain and tenderness in above site. A very slight fulness was noticed close to right costal recession; on percussion dulness was by no means distinct, but on palpation it was thought some deep fluctuation was elicited. A long hypodermic needle was inserted and a syringeful of dark altered blood withdrawn. Chloroform was given, and, assisted by my colleague, Dr. Shadbolt, a two-inch vertical incision was made over site of fulness; the liver was found in close proximity to parietal peritoneum, but non-adherent. The needle was again introduced and at a depth of one-quarter inch a cavity was struck. Sponges were employed as before, the liver was seized by two sharp hooks and drawn forward, and with the handle of a Jordan Lloyd scalpel an opening sufficient to admit the finger was made. As no fluid escaped the opening was considerably enlarged, in order that the interior might be thoroughly inspected. It was found half empty and contained a large quantity of coagula and clots, and about one pint of dark-greenish blood. Its wall was then examined and found to be liver tissue lined with laminated fibrin. As nothing else was present, the diagnosis seemed obvious, an old rupture of liver, with a very large extravasation of blood. The cavity was irrigated and a large quantity of coagula evacuated, some old adherent clots were dislodged with a Volkmann's spoon and removed. Marsupialization having been effected, a large drainage-tube was inserted and dressings applied. For some days after operation many pieces of coagula came away with each irrigation. The temperature did not exceed 99° F., and he was allowed out of bed on the eighteenth day.

On August 13 the nurse, while irrigating, noticed something in the wound. She tried to catch it with dressing-forceps, but it slipped back into the depth of the cavity. On the following day I determined to find out what the "thing" was; a Jacques catheter was attached to nozzle of irrigator and passed deeply into the cavity; with the pressure of the lotion a collapsed necrosing hydatid cyst presented; it was caught with the fingers and removed. Suppuration with nocturnal fever followed; and while the lower end of the hepatic cavity had almost closed, a large space yet remained in the upper part of the liver-substance; and as it did not show any tendency to contract, and as the patient was daily losing ground, on September 12 I removed two and a half inches of ninth rib in axillary line, performed transthoracic hepatotomy, and established a free counter-opening. A stream of lotion readily flowed from the lower wound through the upper and *vice versa*. Rapid contraction of cavity followed, and he was allowed out of bed on September 24. A fortnight later he unfortunately developed a sharp attack of dysentery, which threw him back considerably; however, by free use of stimulants, tonics, and fresh air, he was discharged cured on October 20.

When the first operation was completed no doubt existed in our minds but that the bull made a large rupture in patient's liver, the absence of any cyst and the presence of nothing but altered blood and clots seemed to make it conclusive that extravasation had taken place, and as the cavity was found one-half empty, the inference was that a large quantity of the effused blood had been absorbed, yet the fact remains, on the twentieth day an hydatid cyst was removed. There can be no doubt that both the bull and echinococcus took part in this most extraordinary "piece," but what "the plot of the play" was remains, as far as I am concerned, a matter for speculation. In many of these cases I have noted the fact that the upper part of the cavity in liver is the last to contract, the counter-opening made in this case had a most rapid effect, and in future I will not hesitate to do it in cases that show the same tendency.

CASE XII.—*Collapsed Hydatid Cyst of Liver; Abdominal Section; Recovery.*—R. P., aged thirty-six years, clerk, was admitted on August 6, 1896, with the following history: About two years ago a dull pain commenced in right hypochondrium, just below the ribs, which gradually increased in intensity; six months later he noticed a swelling in same region, but at no time suffered from any rigors, sweats, jaundice, or fever. During this period he was under the care of four different physicians, each of whom diagnosed congestion of liver, and pronounced the case hopeless. As a *dernier ressort*, he consulted a fifth in July last, who, suspecting hydatid, inserted an aspirating needle on July 26, and removed "a bucketful of watery fluid." Fever immediately followed the operation, the tongue became foul, and the pain instead of diminishing became more intensified. His doctor advised removal to hospital in order that an operation might be performed. On examination, patient was very emaciated. Temperature 101.4° F., and tongue thickly coated. A puncture-point was visible in right semilunar line (level of umbilicus); no distention or tumefaction was present. On percussion there was dulness continuous with that of the liver, extending downward from lower border of ribs to level of iliac crest, but no fluctuation was made out. Patient complained of slight tenderness all over right side of abdomen.

He was kept under observation for two days; no rigor or shivering occurred; the evening temperature reached 102° F.; he perspired profusely; and the pulse was 110, small and wiry. The condition was diagnosed as suppuration in a cyst following puncture. On August 8, assisted by my colleague, Dr. Shadbolt, a three-inch vertical incision was made in right semilunar line over site of puncture; on opening the peritoneum, a collapsed, non-adherent cyst presented. As the patient was in a very weak state the cyst was rapidly drawn to surface by two sharp hooks, opened and fixed to parietal wound; it contained a collapsed endocyst, and about one and a half pints of clear hydatid fluid. The interior was sounded by a long probe and found to be of enormous dimensions, the probe passing upward in liver to level of sixth rib in nipple line, and downward to ilium; indeed, it could well contain "a bucketful of fluid." There was not the least trace of suppuration in or about the cyst; no peritonitis. Patient was very much collapsed, and the shock lasted for two days; a week later matters were seriously complicated by an attack of right basal pneumonia. For the following three weeks things looked very bad, but he gradually regained strength, and was discharged cured on the sixty-seventh day.

The interesting feature in this case was the sudden supervention of fever, etc., after tapping. When he entered hospital I felt almost certain suppuration was taking place, most probably in cavity of the cyst; but as none was found at operation, I take it that it was another instance of hydatid toxic poisoning, following the use of a needle. What I said in a previous case in regard to the danger of puncturing an abscess applies equally if not more so to hydatid cysts, now that this toxic poison is a recognized entity, not to mention peritonitis and implantation. Owing to the feeble condition of patient I hurried through the operation and did not attempt removal of a portion of cyst wall; afterwards I regretted I had not done so, for the subsequent suppuration, although slight, was about as much as the patient could stand.

CASE XIII.—*Hydatid Tumor of Liver; Transthoracic Hepatotomy; Recovery.*—J. G., aged forty-seven years, laborer, was admitted into hospital on August 24, 1896. On May 28 previous, when in bed, he was suddenly seized with a stabbing pain beneath right lower ribs; after forty-eight hours it subsided, and he continued at his work during June and July, but occasionally complained of a slight pain about angle of right scapula. On admission he appeared well-nourished, had a good appetite and a normal temperature; liver dulness was found increased upward to upper border of fourth rib, breath-sounds were absent over this area, and nothing else abnormal was noticed in his condition. On August 30 a colleague, for diagnostic purposes, at my own request, inserted a long hypodermic needle into fifth intercostal space, and a syringeful of clear hydatid fluid was drawn off; ten minutes later patient was covered with a profuse urticarial rash, and the temperature was found to be 101° F. Same evening the temperature reached 102°, and on the following morning the rash had almost disappeared, but the temperature yet remained over 100°.

Chloroform was administered and, assisted by my colleague, Dr. Shadbolt, three inches of the sixth rib were removed in axillary line, the costal and diaphragmatic pleuræ were incised and united to the diaphragm by a circular continuous silk suture. The entry of air into the pleural cavity at this stage of the operation caused no respiratory inconvenience. The diaphragm was next incised, and as the liver was found non-adherent, a circular continuous silk suture was passed through capsule and diaphragm. As fluctuation was readily elicited through the portion of liver thus exposed, a large-sized, curved trocar and canula were inserted, and three pints of clear hydatid fluid evacuated; the trocar was removed, the opening enlarged by finger, and cavity irrigated with warm Condy's fluid, until the endocyst was expelled; no pus was found. A large drainage-tube was inserted and dressings applied. Convalescence was delayed by a very persistent biliary fistula, and he was not discharged cured until the 4th of December.

The rapid supervention of toxic symptoms after tapping adds further proof as to the danger of using a needle as a means of arriving at a definite diagnosis. In a recent epitome of the *British Medical Journal* a most lamentable case of hydatid tapping was recorded, in which death occurred within two minutes; with such experience, the question that must naturally arise is, Is the use of the needle justifiable, even if the diagnosis is not obvious? In many cases it is undoubtedly a very convenient instrument, yet convenience must never be allowed to weigh against a grave danger. I have never met with, nor have seen recorded, hydatid toxic poisoning following the operation of marsupialization; therefore I conclude that an open wound is as harmless as diagnostic puncture is dangerous. Doubtless there are some who may reasonably say, Why not dispense altogether with such a means of diagnosis? All the same, I confess I look on removal of a portion of a rib, opening pleuræ and diaphragm, a serious measure, and only advisable in cases where fluid is certainly present. I think, if it were made a rule that the needle should only be used on the operating table, and if fluid is struck, it should at once be removed by an open incision, that in the great majority of cases the danger of toxic poisoning would be eliminated.

CASE XIV.—*Hydatid Liver; Cœliotomy; Recovery.*—J. M., aged thirty-two years, servant, was admitted to hospital on October 26, 1896. On examination the liver was found enlarged downward to the level of the umbilicus, and deep fluctuation was elicited; there was no history of fever, sweats, rigors, jaundice, or wasting.

On October 28 chloroform was administered and a three-inch incision made in right semilunar line. On opening the peritoneum, liver-substance presented, sponges were applied as before, a trocar and canula were inserted into liver, and at the depth of one-third of an inch a cyst was struck; with a Paquelin cautery an opening was made along-side of the canula, and the cyst was seized with two sharp hooks and drawn to surface. An opening was next made into the cyst and about three pints of clear fluid evacuated; with irrigation the collapsed endocyst and eighteen daughter cysts were removed; the latter varied in size from that of an orange to a pea. On examining the boundaries of cyst it was found completely surrounded by liver-substance; in fact, this organ was literally converted into a bag of hydatid cysts. Marsupialization having been performed, a large drainage-tube was inserted. The cavity was irrigated twice a day with warm Condy's fluid, and an uninterrupted convalescence followed. Contraction of the cavity was hastened considerably by the occasional use of a long Volkmann's spoon. This method of removal of cyst wall rendered suppuration unnecessary, and, consequently, hectic was absent throughout convalescence, and he was discharged cured on December 14.

I wish to mention that, as yet, I have never detected hydatid fremitus; whether this is due to my want of tactile appreciation or not, I cannot say.

AN ANALYSIS OF TWO HUNDRED AND TWENTY-ONE CASES OF FOREIGN BODY INTRODUCED INTO THE MALE BLADDER PER URETHRAM, WITH REPORT OF A RECENT CASE.

By FRANCIS R. PACKARD, M.D.,

OF PHILADELPHIA.

ON August 16, 1896, a gentleman came to my office with the following history: He was an electrical engineer, twenty-seven years old, married, and the father of one child. He had always enjoyed good health and been strong and vigorous. Fourteen years before coming to me, when he was about thirteen years of age, he had in a spirit of mischief inserted a watch-chain bar, made of vulcanized India-rubber, into his urethra. It had slipped from his fingers and been lost in the canal. He stated that after it disappeared he felt much alarm for a time, but as it gave him no pain he soon forgot about it. However, at intervals, ever since its introduction he has experienced sharp pain at the meatus, and also had considerable pain in the hypogastrium. Had especially severe attacks of pain several times immediately after micturition. None of these attacks were sufficiently severe to make him deem it worth while to consult a physician. About two months previous to coming to my office he had begun to ride a great deal on a bicycle, and ever since doing so he has suffered much from the symptoms of vesical irritation. Several times while urinating the flow had suddenly been checked, and he had had much pain in the region of the bladder, accompanied by an almost constant desire to urinate.

He attributed all these symptoms to excessive bicycle-riding, as he said he thought he must have passed the foreign body at some time with his urine without its passage attracting his notice.

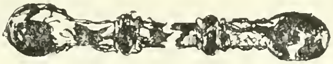
I introduced a metallic sound, and after a few moments it came in contact with an object in the bladder, which, however, dodged away the instant the sound touched it.

The next day he returned, bringing with him a specimen of his urine, which was normal in every respect except that it contained considerable epithelial *débris*, apparently derived from the bladder.

On August 22, 1896, he was etherized at his home by Dr. Walter Roberts, and, assisted by Drs. J. M. Spellissy and J. H. Gibbon, I proceeded to perform median cystotomy upon him. Before operating I inserted a sound, and by its contact with the foreign body elicited a click distinctly audible to those in the room.

After opening the bladder the object of my search was located lying close to the middle lobe of the prostate. It was so rotten that in the process of extraction it broke into two fragments. The wound pursued a healthy course to recovery. On the twelfth day after the operation he went in bathing in the ocean at Atlantic City. He has been entirely well ever since.

The accompanying cut, kindly drawn for me by Dr. Spellissy, shows very accurately the condition of the foreign body immediately after removal. It was very slightly incrusted with phosphates.



Showing bar removed from the bladder.

In connection with this case I have collected and analyzed 221 other instances in which a foreign body has been introduced into the male bladder *per urethram*. I have avoided as far as possible in my study including any of the cases which have been heretofore brought together in any of the exhaustive statistical articles on this subject, contenting myself with bringing together the stray cases to be found in isolated reports.

As we should expect to find, foreign bodies are much rarer in the male bladder than they are in the female. The difference in length and calibre between the male and female urethra probably furnishes a sufficient explanation of this point.

As to why a foreign body introduced into the male urethra should be propelled onward and enter the bladder instead of being expelled through the meatus, it is now generally conceded to be because of the suction power possessed in most instances by the urethra, which tends by a sort of vermicular motion to draw the object into the bladder when once it has entered its grasp.

This point was long in dispute. Christopher Heath, in 1876, made the statement that he had "noticed in perfectly healthy urethræ that there is a constant vermicular contraction of the wall of the canal, passing towards the bladder, and this accounts for the well-known fact that foreign bodies in the urethra tend to pass in that direction. This is wanting in any case where induration exists." In relation to the latter part of Mr. Heath's statement it is to be noted that most of the instances of foreign body in the bladder occur in those who are the victims of stricture or of some other pathological condition of the genito-urinary tract. This may be largely explained by the fact that usually in such cases the foreign body is a catheter or bougie which is broken in the grasp of the stricture, generally while being withdrawn, leaving the part on the bladder side of the stricture behind.

Sir Henry Thompson took exception to the views of Mr. Heath, and held that the motion of the urethral canal was in the opposite direction.

Agnew (" Principles and Practice of Surgery," Vol. II, p. 457, 1891) says that he had had " ocular demonstration of this urethral and vesical deglutition." He relates an instance in which " finding the resistance to the extraction of a catheter very marked, I proceeded, in order to satisfy myself of the reality of the so-called suction-power of the bladder and urethra, to dally with the instrument for a time. Accordingly, after pulling it a little way through the orifice of the urethra, I would relax my hold, when it would be immediately drawn in, and sometimes with singular rapidity."

The nature of the foreign bodies which have been found in the bladder is so very various that it is difficult to attempt any classification of them. I have, however, divided them into two great classes, the first including the cases in which the foreign body was a surgical instrument or a fragment of a surgical instrument. The second class takes in all the cases in which the foreign body was not of the nature of those embraced by the first class.

Taking up first the consideration of the cases in which the foreign body was a surgical instrument or a piece of a surgical instrument we find they number in all 108 cases; made up as follows:

Whole flexible catheters	12	cases.
Fragments of flexible catheters	30	“
Whole gutta-percha bougies	9	“
Fragments of gutta-percha bougies	22	“
“ “ silver catheters	7	“
“ “ Nélaton catheters	2	“
“ “ English catheters	4	“
“ “ Mercier catheters	5	“
“ “ vulcanized India-rubber catheters	4	“
“ “ filiform bougies	2	“
“ “ slippery-elm bougies	2	“
Fragment of catgut bougie	1	case.
Ivory catheter tip	1	“
Fragment of guide for internal urethrotomy . .	1	“
“ “ Squire's vertebrated catheter . .	1	“
Whole pilot bougie	1	“
Two whole filiform bougies	1	“
Fragment of metallic sound	1	“
Whole English catheter	1	“
Medicated gelatin bougie	1	“

Among the above cases we find the following, which possess especial interest:

F. S. Edwards (*British Medical Journal*, 1882, I, p. 816) extracted with a lithotrite a pilot bougie twelve inches in length, which had been lost in the bladder of the patient two days previously by another surgeon.

William Fergusson (*Lancet*, 1863, II, p. 215) extracted with a lithotrite a gutta-percha bougie twelve inches in length, which had been introduced into the bladder by the patient, a boy of nineteen, two months previously. It was somewhat incrusted.

Ebermann (*St. Petersburger medicinische Zeitschrift*, 1871, II,

p. 295) reports a most remarkable case in which he extracted from a man's bladder two whole filiform bougies which had been left in by a doctor three months before.

F. L. Parker (*Transactions of the South Carolina Medical Association*, 1883, p. 93) performed median cystotomy on a young man and removed two gum elastic bougies which the patient had mischievously introduced into his bladder three or four months previously. There was a good deal of uric acid deposit upon them. The patient made a good recovery.

C. W. Oviatt (*North American Practitioner*, Chicago, 1892, IV, p. 35) found as the nucleus of a stone which he had removed by lateral cystotomy a medicated gelatin bougie, which had been introduced by the patient some twenty months prior to the operation. The bougies made of slippery-elm, of which we notice two instances of fragments having been left in the bladder, were strongly advocated by Dr. Rezin Thompson.

Bougies made of catgut were quite largely used in the first half of the century. There is only one instance among the cases I have collected in which a Squire vertebrated catheter was broken during its use, and as the dangers of this jointed form of instrument have been so much expatiated upon, I think this is rather noteworthy.

W. A. Byrd (*Medical and Surgical Reporter*, Philadelphia, 1884, L, p. 104) reports this case. He says the instrument broke during auto-catheterization, and he removed the fragment by Bigelow's operation.

At one time there was a great outcry against the gutta-percha bougie, which was in very general use, and we find many instances of their breaking recorded and the dangerous results therefrom.

The methods in which these various instruments were introduced are instructive.

In seventeen of the cases the instrument was in the hands of a physician. In eighty-one instances the patient was using it on himself. Twice a layman was endeavoring to catheterize the patient. In seven cases the method of introduction was not stated. There is no doubt that probably many times a physician has had an instrument break while using it, leaving a fragment in the urethra or bladder, which he may have proceeded to extract immediately, or else may, through ignorance or fear, have allowed it to remain in the viscus. In the cases I have gathered there are eleven instances in which a doctor allowed an instrument, or the fragment of one, to remain in either the urethra or bladder. Almost every one will recall the classical case mentioned in Cooper's "Surgical Dictionary," in which a surgeon was catheterizing a woman for retention of urine; "during the operation he was observed to exhibit signs of confusion, and to quit his patient in considerable embarrassment. The same day he abruptly left his home and never was seen afterwards. The lady passed some years of dreadful suffering, attributed to aggravation of her original complaint. At length an abscess appeared in the sacral region, and on puncturing the instrument came in contact with a hard substance, which, when extracted, proved to be a blackened female catheter. The lady's sufferings ceased."

However, as a matter of course, patients are much more careless in their use of instruments, and are apt to use cheap, brittle catheters or bougies, and not to notice any defect which may exist in them, or to continue their use after they are old and rotten and therefore easily fractured.

Turning now to review the foreign bodies, other than surgical instruments, which have been found in the male bladder, we cannot but be amazed at their remarkable variety. As can be seen by the appended list, they are of all conceivable forms and shapes. They also vary greatly as to size, some of them being so large as to justly excite our wonder that their entrance into the bladder could possibly have been effected.

In the cases I have collected we find the following:

Lead-pencils or fragments of lead-pencils . .	11 cases.
A pencil with a bone tip	1 case.
Wooden pencil with metal cap	1 "
Wooden pencil with rubber in metal cap . .	1 "
Brass lead-pencil guard	1 "
A metallic pencil-case	1 "
A pen-holder	1 "

A piece of a bone pen-holder	1 case.
A piece of a wooden pen-holder	1 "
Pieces of rubber tubing	6 cases.
" " straw	5 "
" " wood	5 "
" " slate-pencils	4 "
" " wire	4 "
" " steel	3 "
" " stems of plants	4 "
" " glass tubes	3 "
" " glass rods	2 "
" " sealing-wax	5 "
" " candle-wax	2 "
" " wax	2 "
" " paraffin	3 "
" " feathers	2 "
Kidney beans	3 "
Pipe-stems	3 "
Clay pipe-stems	2 "
Glass pipe-stem	1 case.
Cane pipe-stem	1 "
Cigarette-holder	1 "
Pieces of chewing-gum	2 cases.
" " bone crotchet-needles	2 "
Toothpick	1 case.
Button-hook	1 "
Pine-leaf	1 "
Head of wheat	1 "
A piece of cane	1 "
Two porcelain shirt-buttons	1 "
A piece of grass	1 "
" " rolled-up paper	1 "
A cylinder of pork	1 "
" " potato	1 "
A paint-brush	1 "
Leather shoestrings	2 cases.
A galvanized metal watch-chain	1 case.
A pin	1 "
A shawl-pin	1 "
A hair-pin	1 "

A sewing-needle	1	case.
A bone enema-tube with quill attached to it	1	"
A piece of chalk with a string to it	1	"
A piece of cord	1	"
A cork	1	"
A metal-cap four centimetres long	1	"
An ear-spoon	1	"
A threepenny piece	1	"
An India-rubber umbrella ring	1	"
A cordwainer's awl	1	"
Also my own case of a vulcanized rubber watch-chain bar.		

The various ways in which the introduction of these objects was accounted for are of much interest. In thirty-four cases the patient acknowledged that his object had been to produce sexual excitement. In thirteen cases the relief of urethral irritation was assigned as the cause. In nine cases the object was to relieve retention of urine. In two cases, on the other hand, the agent was introduced to check incontinence of urine. In four cases the patient was endeavoring to push back gravel which had entered the urethra from the bladder. The maliciousness or mischievousness of friends was responsible in seven cases. In one instance the patient introduced the object hoping thereby to check nocturnal emissions. In another he was endeavoring to give himself an injection for gonorrhœa. In thirty-nine cases no reason could be obtained.

That we should not rashly question the truthfulness of a patient's statement as to how the foreign body got into the bladder may be instanced by the following cases:

Leonard (*Cincinnati Lancet and Observer*, 1872, xv, p. 429) reports the case of a man who, while working in a wheat-field, experienced a tickling sensation at the meatus urinarius. He was not able at once to cease his work and search for the source of the irritation, but it subsided after a little time, and he had forgotten all about the occurrence until a few months later he began to manifest symptoms of vesical calculus. Dr. Leonard performed lateral cystotomy on him, six months after the episode in the wheat-field, and removed a calculus, the nucleus of which was a head of wheat.

H. W. Freeman (*Lancet*, 1885, I, p. 340) performed lateral cystotomy on a boy aged four years, and extracted from his bladder a phosphatic calculus, the nucleus of which was a darning-needle, which his mother had seen him swallow eighteen months previously.

A curious case is recorded by Reginald Harrison (*Lancet*, 1885, I, p. 287) of a sailor, admitted to hospital with symptoms of stone in the bladder, from whom he removed, by lateral cystotomy, a calculus having for its nucleus a whalebone tobacco-pipe mouth-piece, which the man persisted in asserting he had swallowed a long time before. It still retained a distinct odor of tobacco.

Alfred Roberts (*Medical Times and Gazette*, London, 1859, XL, p. 113) extracted by perineal cystotomy a phosphatic calculus from a man aged forty-seven years, having a piece of slate-pencil as its nucleus, which had been swallowed accidentally by the man, in the presence of reputable witnesses, six months before. There are also numerous instances of foreign bodies which have got into the viscus, by a process of ulceration, from neighboring parts.

Thus Otis (*Medical Gazette*, New York, 1880, VII, p. 181) reports a case in which he removed a calculus by perineal cystotomy, the nucleus of which was a piece of cloth which had formed part of the seat of the man's trousers when he had sustained a serious injury to his perineum by a fall a long time before the operation.

T. M. Ghose (*Indian Medical Record*, Calcutta, 1893, V, p. 387) reports the case of a boy, aged five years, upon whom he performed lateral cystotomy, extracting from his bladder a splinter of wood which had been driven into his perineum by a fall one year previously.

Many cases are recorded in which gunshot wounds have occurred in neighboring organs and the bullet subsequently been extracted from the bladder. The duration of the stay of foreign bodies in the bladder varies greatly. In many cases it is difficult to determine just how long the foreign body has been in the bladder, or how long it may have been in the urethra before reaching that organ. In my own case, I think the fact that it had been in the bladder the greater part, if not the whole, of the fourteen years is proven by the occasional occurrence of pain in the hypogastrium, and at the meatus urinarius immediately after urination, and by the fact that there was no retention of urine, while he at times suffered from the symptoms of vesical irritation. I lay stress on the absence of retention of urine, because, had the foreign body been lodged in the urethra or prostate, the paroxysmal attacks which he had, undoubtedly due to the movements of the foreign body, would in all probability have been accompanied at some time or other by occlusion of the canal.

Fleury (*Bulletin de la Société de Chirurgie de Paris*, 1878, IV, p. 39) reports a most interesting case. A man came to the hospital at Clermont suffering from the symptoms of stone in the bladder. On examination he was found to have a recto-vesical fistula. He frequently passed gases through his urethra, which evidently emanated from his rectum. Fleury performed bilateral cystotomy and removed a cordwainer's awl, covered over with calculous material, from the bladder. The man persisted in saying that the awl had been inserted into his urethra by a companion fifteen years before he came to the hospital. This is the longest duration of any foreign body in the bladder of which I can find a record, except the case reported by Steinitz (*Breslau Aertzl. Zeitschrift*, 1879, I, p. 24), in which a fragment of rubber catheter remained in a man's bladder seventeen years, and was passed spontaneously after Steinitz had dilated a stricture in the patient's urethra. My own case ranks third in duration.

Hanke (*Journal der Chirurgie und Augenheilkunde*, Berlin, 1835, XXIII, p. 497) records a case in which he removed by perineal cystotomy an earspoon from the bladder of a man who said it had been introduced many years before.

J. W. Baker (*British Medical Journal*, 1874, II, p. 709) performed lateral cystotomy on a man and removed a calculus having as its nucleus a fragment of rubber catheter, which had been broken in the bladder five years previously.

Van Buren (*New York Medical Times*, 1854, III, p. 225) removed by lateral cystotomy, from the bladder of a young man twenty years of age, a piece of slate-pencil, which had been introduced by a comrade five years before.

Brown (*Johns Hopkins Bulletin*, 1892, III, p. 75), Gillon (*British Medical Journal*, 1887, II, p. 239), and Cutler (*Lancet*, 1859, I, p. 185), all report cases in which the duration of the stay was three years.

I have also collected nine cases in which a foreign body remained in the male bladder for two years.

The amount of incrustation, as would be expected, varies greatly with the nature of the foreign body. On this point Poulet ("Treatise on Foreign Bodies in Surgical Practice") says, "All authors are not agreed upon the immunity of some bodies from incrustation. Some believe with Nélaton that certain substances, such as wax, are never incrusted. The observation of a considerable number of cases studied with reference to this question has proven that no substance is completely free from vesical incrustation, though all are not equally predisposed to it."

Smooth substances, such as glass, are, of course, much less likely to become incrusted than rough objects, which offer points of vantage for the lodgement of calculous material. In my own case there was but very little incrustation. I think this is to be attributed to the fact that it was smooth, and being very light did not remain in one position any length of time, but floated about rather freely.

Another circumstance which seems to have been quite overlooked by those who have written upon this subject is as regards the condition of the bladder at the time of the entrance into it of the foreign body. My patient was in perfect health, young, strong, and vigorous. In the majority of cases, however, there is apt to be some pathological condition of the bladder or urethra, and under such circumstances deposition of calculous material as a rule quickly occurs.

Again, in the greater number of instances the foreign body has been removed so soon after its entrance that there has not been time for any deposition to occur.

Of the 222 cases that I have collated we find that in seventy-four no statement is made as to whether the foreign body was incrusted or not. In forty-nine there was no deposit. In thirty there was a deposit of phosphates. In four cases there was a deposition of uric acid. In two there was a mixed deposit of the phosphates and uric acid. In one case there was stated to have been a deposit of ammonio-magnesium salts. In fifteen cases the foreign body formed the nucleus of a phosphatic calculus, in one case of a uric acid calculus, and in one case of a mixed uric acid and phosphatic calculus. In twenty-one instances there was simply the statement that the foreign body was incrusted. In twenty-four cases the foreign body was stated to have formed the nucleus of a calculus, the nature of the calculus not being reported.

As regards the exit of foreign bodies from the male bladder, there are three general heads under which we may classify all the cases.

(1) Those cases in which the foreign body is expelled spontaneously.

(2) Those in which the foreign body is extracted with instruments without any cutting operation and excluding lithotrity.

(3) Those in which the removal of the foreign body is effected by means of cystotomy or lithotrity.

Unfortunately the spontaneous emission of a foreign body is of very rare occurrence. Among 391 cases of foreign body in the male bladder, collected by Denucé (*Journal de Bordeaux*, 1856), only fourteen terminated in this happy manner.

In my collection of 222 cases there were only fourteen of this kind. Of these fourteen instances in six the foreign body was a piece of gutta-percha bougie, in two it was a fragment of flexible rubber catheter, and in two it was a whole flexible rubber catheter.

Of the remaining cases Coulson (*Medical Times and Gazette*, London, 1856, XIII, 212) reports a case in which three inches of a silver catheter remained in the bladder for three weeks and was then expelled spontaneously.

Maxwell (*Transactions of the South Carolina Medical Asso-*

ciation, 1870, p. 15) saw a case where a young man, while masturbating, introduced a pine-leaf into his urethra, from whence it got into the bladder. It passed out with the urine a few days later.

Dr. William Hunt (*Philadelphia Medical Times*, 1872) had a boy under his care who had introduced a galvanized metal watch-chain into his urethra. It slipped into the bladder, and when Dr. Hunt saw him it was completely within that organ. Dr. Hunt directed that the boy should drink copiously of water, be given a diuretic mixture, and should hold his urine as long as possible. The watch-chain was passed with the first gush of urine.

H. M. Wheeler (*Physician and Surgeon*, Ann Arbor, 1879, I, p. 262) reports the case of a young man who had passed a button-hook into his bladder. It was passed spontaneously on the day before that which had been set by the attending surgeons to operate for its extraction.

In this connection Fleury (*Bulletin de la Société de Chirurgie de Paris*, 1878, IV, p. 343) reports a case in which a metallic sound broke, leaving a fragment in the bladder. Four days later, while straining at micturition, the fragment appeared just within the margin of the anus, protruding into the rectum, whence it was easily extracted by the surgeon's fingers.

A. Post (*Boston Medical and Surgical Journal*, 1881, CXXI, p. 630) had a man under his care who, three months before consulting him, had introduced a lead-pencil into his urethra to relieve some irritation there. It had slipped from his grasp and entered the bladder. By straining down, the patient caused it to protrude into the urethra, whence Dr. Post was able to extract it with forceps.

Of the cases in which measures not involving an operation were employed for the extraction of the foreign body we find forty-eight cases in which extraction was accomplished by means of the lithotrite, without crushing the object. In six instances instruments especially constructed to meet the individual case were used. In three cases a *brisée pierre* was employed, in three cases forceps of various kinds were used. In two cases Heurteloup's instrument, and in one case Mercier's instrument were used to effect the extraction. In one case Collin's *redresseur* was employed. In one case a lithotrite scoop effected the purpose. In three cases the foreign body was found at the autopsy.

Gregory (*Humboldt Medical Archives*, St. Louis, 1868, II, 280) had as a patient a man who several years previously, during auto-catheterization, broke off the tip of a small silver catheter in his bladder. When he came under Dr. Gregory's care a calculus had formed about the catheter tip, and he presented all the symptoms of stone in the bladder. Dr. Gregory crushed off with a lithotrite the calculous material, but could not succeed in grasping the foreign body and extracting it, although it could be distinctly felt. He left it in the bladder, as he deemed the man too weak for operation. The patient was much disgruntled and passed from under Dr. Gregory's care. The further history of the case is not known.

W. Johnson (*British Medical Journal*, 1889, I, p. 743) reports an interesting case of a whole rubber catheter disappearing into the bladder during the attempt of a layman to catheterize the patient. When seen by Dr. Johnson a portion of the catheter projected from the bladder into the membranous urethra. By some delicate manœuvring he managed to engage a sound of smaller calibre than the catheter in the protruding portion and thereby withdrew the whole instrument.

The operative measures which have been employed to effect the extraction of foreign bodies from the male bladder include practically every method devised for the extraction of vesical calculi. In my series of cases lateral cystotomy heads the list, there having been forty-three cases in which it was performed. In forty-two, median cystotomy was done. In twelve cases the operation was merely stated to have been a perineal cystotomy; and in twelve cases suprapubic cystotomy was performed. Lithotrity was resorted to in ten cases, litholapaxy in six cases, bilateral cystotomy in three cases, medico-bilateral cystotomy in one case, Allarton's median cystotomy in one case.

In one case the foreign body was extracted with forceps through an incision in the membranous urethra. In three cases it was extracted with a lithotrite after internal urethrotomy.

Denucé analyzed 249 cases with regard to the method of extraction, and found prior to 1830 there had been 100 cases of lithotomy, and 27 cases in which the foreign body had been extracted without operation. Between 1830 and the date of his article (about 1855 or 1856) he had collected only 21 lithotomies among 122 cases.

I have collected 186 cases occurring between the year 1850 and the present time (1897), in which either operation or extraction was necessary to remove the foreign body.

Among these cases there were 104 operations and 78 extractions. In four other instances the operator was able to get the foreign body out after doing a urethrotomy. Under extractions I include, of course, lithotrity or litholapaxy.

As we would surmise from the number and variety of the procedures which have been used for the removal of foreign bodies from the male bladder, it is practically impossible to formulate any general rule as to the most available measure. Each case must be judged for itself.

G. Buckston Browne, who has had much experience in dealing with cases of this kind, says, in his article on foreign bodies in the bladder, in Heath's "Surgical Dictionary," that extraction should first be attempted with a lithotrite or with Sir Astley Cooper's forceps, or if the foreign body be small, like a bead or pebble, we may try to wash it out through an evacuating lithotrity tube. If these fail, he advises that in boys a lateral cystotomy should be performed, in adults an external urethrotomy (*la boutonnière*), and the foreign body removed with forceps through the incision. Should this not be possible, the operation should be converted into a median cystotomy.

Ashhurst ("Principles and Practice of Surgery," Fifth Edition, 1889, p. 416) says that foreign bodies "may occasionally be spontaneously expelled from the bladder, or may be extracted with urethral forceps or a small lithotrite, if the surgeon succeed in catching them in the direction of their long axis.

In the male, however, it is usually necessary to resort to lithotrity (if the nature of the body admit of its being crushed) or to lithotomy, the median being in such cases the preferable operation.

Willard (Philadelphia *Medical News*, November 26, 1887), in a paper read before the Philadelphia County Medical Society, said he desired to emphasize the value of the evacuator in cases of foreign body, as well as to remove calculous fragments. He said it had been so satisfactory in his hands that he always resorted to it with confidence to the exclusion of all other primary devices. This method does not seem to have been adopted to the extent its apparent value warrants, as there are but few mentions of its having been tried.

Henriet (*Annales des Maladies des Organes Genito-Urinaires*, Paris, 1883–84, II, 235) advocates, first, the use of an ordinary lithotrite as a means of grasping and withdrawing the object. He says it is much to be preferred above all the various complicated instruments devised for this purpose. If this is not successful, he says, lithotrity should be done, as it is better than any cutting operation. Most French authorities agree in this statement, and in France it seems to be the almost universally adopted routine method for the extraction of foreign bodies.

The toleration possessed by the bladder for foreign bodies is more than we would be apt to infer from our ordinary conceptions of the ease with which a cystitis may be established.

In the 222 cases in my series there were but twelve deaths, the other 210 patients making complete recoveries. Of the cases which resulted fatally, we can see by the following abstracts that two of them were not directly due to the foreign body in the bladder.

J. S. Wight (*Brooklyn Medical Journal*, New York, 1890, IV, p. 561) performed perineal cystotomy on a man aged forty-five years, and removed a piece of a soft catheter which had been broken in the bladder eighteen months before. The man was convalescing from the operation when he died of an intercurrent dysentery.

W. S. Harvey (*Clinique*, Chicago, 1894, XV, p. 249) reports a case in which he removed by suprapubic cystotomy a fragment of hard rubber catheter which had been left in the bladder of the patient four days previously by another doctor who was catheterizing him. The man did well after the operation, but died on the eighteenth day of pulmonary phthisis, with which he had long been afflicted.

Of the remaining ten cases, in three the foreign body was found at autopsy: thus Henry Morris (*Guy's Hospital Reports*, 1846, v, p. 241) records the case of a man who was in the habit of introducing straws into his urethra to relieve irritation there, from which he often suffered. One month before coming to Guy's Hospital a straw had broken, leaving a fragment in his bladder. When he came to the hospital he was much emaciated and too weak for operation. He died, and at the autopsy a vesical calculus was found, having as its nucleus a bit of straw.

Steiner (*Weiner medicinische Wochenschrift*, 1868, XVIII, p. 745) found at an autopsy on a man who had suffered from cystitis for six years a calculus, the nucleus of which was a rolled-up piece of paper. The patient had died from peritonitis, the result of perforation of the bladder.

Gould (*British Medical Journal*, 1858, LVIII, p. 100) reports the case of a man, aged twenty-seven years, who, when seen, was so weak that an operation was deemed unadvisable. The patient died, and at the autopsy there was found a calculus having as its nucleus the stem of a plant, which had been introduced by him a long time before to allay urethral irritation.

In the remaining seven cases death occurred after operation. They were as follows:

McWhinnie (*Medical Times and Gazette*, London, 1856, XIII, p. 591) performed perineal cystotomy on a man aged twenty-six years, and removed a piece of sealing-wax from his bladder, into which it had been introduced four years before. The patient was very weak and emaciated and died shortly after the operation.

Van Buren (*Transactions of the New York Pathological Society*, 1879, III, p. 229) performed lateral cystotomy on a man, and extracted from his bladder a calculus, having for its nucleus a piece of wheat-straw, introduced by the patient many years before. Death occurred, sixteen days after operation, from pyæmia.

H. Fenwick (*Transactions of the Pathological Society of London*, 1867, XXXVIII, p. 193) reports the case of a deaf mute, who had suffered from symptoms of stone in the bladder for three months. The patient was a sexual pervert. Mr. Fenwick performed lithotrity. Death occurred shortly after the operation, and at the autopsy an India-rubber umbrella ring was found in the bladder. Death had resulted from purulent peritonitis, the result of perforation of the bladder.

J. C. Nott (*New Orleans Medical and Surgical Journal*, 1858, XV, p. 183) performed lateral lithotomy on a man, aged thirty-four years, who through sexual perversion had introduced a piece of wax into his bladder five months before. He found eight calculi but no wax. The patient died four days after the operation.

Weiss (*Wiener medicinische Wochenschrift*, 1873, XXIII, p. 661) removed a piece of steel, five and a half inches in length, from the bladder of a man by perineal cystotomy. The man died three weeks after operation.

Brown (*Johns Hopkins Bulletin*, 1892, III, p. 75) relates the case of a man, aged fifty-nine years, upon whom he performed lateral cystotomy. The patient three years previously, during auto-catheterization, had had a No. 16 F. catheter break in his bladder. When Dr. Brown operated, the man was very much emaciated, and had suffered for a long time from cystitis and pyelonephritis. He extracted the fragment surrounded by a mass of calculous material. The patient only survived the operation twenty-two hours.

Bryant (*Lancet*, 1881, I, p. 45) reports the case of a man, aged thirty-nine years, who had an old stricture. Two days previous to admission to Mr. Bryant's ward in the hospital, he had broken off a fragment of catgut bougie in his bladder. Mr. Bryant did a median cystotomy. The patient died three weeks later of purulent peritonitis. At the autopsy the posterior wall of the bladder was found to have been perforated.

These cases serve to show how rarely a foreign body in the bladder is the cause of death. In every case death as the result of the presence of the foreign body might, in all reasonable probability, have been avoided, had the patient not neglected himself or purposely concealed his condition.

As regards the diagnosis of the presence of a foreign body in the bladder, the means first employed have been, as a rule, those ordinarily adopted to ascertain the presence of a vesical calculus.

The Germans, and many authorities in this country, are strong advocates of the use of the cystoscope to determine the exact nature and position of the foreign body. No doubt the *x*-rays will prove of service when the nature of the foreign body is such as to be impervious to them. I spoke to Dr. H. W. Cattell about their application in my case, but he informed me that they would not show the substance of which it was composed.

LIST OF CASES OF FOREIGN BODIES IN THE MALE BLADDER, INTRODUCED THROUGH THE URETHRA.

1. ABBE, R.: Seventy years; rubber catheter; tied in urethra by a doctor; extracted with a lithotrite; over six months; recovery.—New York Medical Record, 1881, XX, 705.

2. ADAMS, J. A.: Thirty-four years; glass rod; slipped in urethra by a woman; incision in membranous urethra; three or four weeks; recovery.—Glasgow Medical Journal, 1883–84, XX, 24.

3. ADAMS, J. A.: Fifty-five years; piece of black elastic catheter; during auto-catheterization; suprapubic cystotomy; two years; formed nucleus of phosphatic calculus; recovery.—Lancet, London, 1889, I, 1243.

4. AINSWORTH, F. E.: Fifty years; piece of straw; to induce sexual excitement; lateral cystotomy; three months; four phosphatic calculi found, each with a piece of straw as a nucleus; recovery.—New York Medical Record, 1881, XX, 64.

5. AMUSSAT, A.: Eighty-two years; piece of gum catheter; during auto-catheterization; extracted with a lithotrite; a few days; recovery.—Gazette des Hôpitaux, Paris, 1891, 497.

6. AMUSSAT, A.: Twenty-six years; stick of wood; masturbation; extracted with a lithotrite; five days; recovery.—Gazette des Hôpitaux, Paris, 1891, 497.

7. ANDERSON, WILLIAM: Adult; piece of home-made gutta-percha bougie; being passed by patient; passed spontaneously; some hours; no deposit; recovery.—Lancet, London, 1863, p. 261.

8. ASHHURST, J.: Sixty-one years; piece of rubber catheter; auto-catheterization; median cystotomy; seven weeks; phosphatic deposit; recovery.—Philadelphia Medical Times, 1882–83, XIII, 153.

9. Baker, J. W.: Adult; piece of rubber catheter; auto-catheterization; lateral cystotomy; five years; formed nucleus of phosphatic calculus; recovery.—British Medical Journal, London, 1874, II, 289.

10. Baylies, W.: Adult; stem of plant; perineal cystotomy; five months; formed nucleus of a calculus; recovery.—Massachusetts Medical Society, Boston, 1808, I, 90.

11. Bazy, P.: Adult; toothpick; masturbation; withdrawn by Collin's *redresseur;* recovery.—Annales des Maladies des Organes Genito-Urinaires, Paris, 1883–84, II, 235.

12. Bazy, P.: Forty years; cylinder of pork; masturbation; withdrawn by specially-made forceps; recovery.—Annales des Maladies des Organes Genito-Urinaires, Paris, 1891, IX, 14.

13. Beall, E. J.: Twenty years; piece of slate-pencil; to relieve urethral irritation; median cystotomy; ten days; somewhat incrusted; recovery.—Texas Courier Record of Medicine, 1885–86, III, 494.

14. Berger: Fifty-two years; clay pipe-stem; median cystotomy; recovery.—Bulletin et Mémoire de la Société de Chirurgie, Paris, 1885, N. S. XI, 345.

15. Billroth: Adult; paint-brush; extracted with lithotrite; fourteen days; recovery.—Allgemeine Wiener medicinische Zeitschrift, 1884, XXIX, 129.

16. Birkett, J.: Adult; piece of gutta-percha catheter; auto-catheterization; lithotrity (two crushings); one month; formed nucleus of a uric acid calculus; recovery.—Lancet, London, 1858, I, p. 11.

17. Bisshopp, J.: Twenty-two years; ivory crochet-needle; masturbation; median cystotomy; four days; incrusted with lithates; recovery.—British Medical Journal, 1875, I, 747.

18. Boeckel: Twenty-six years; two porcelain shirt-buttons; masturbation; extracted with lithotrite; some days; no deposit; recovery.—Gazette Médecine de Strasbourg, 1878, 3. S., VII, 4.

19. Boyer: Forty-one years; rubber sound; being passed by patients; crushed and withdrawn with lithotrite; some days; no deposit; recovery.—Gazette des Hôpitaux, Paris, 1856, XXIV, 222.

20. Briggs, W. T.: Adult; piece of steel; to relieve urethral irritation; extracted with lithotrite; five days; recovery.—Nashville Journal of Medicine and Surgery, 1889, XLIII, 133.

21. Briggs, W. T.: Adult; piece of chewing-gum; medio-bilateral cystotomy; three or four months; formed nucleus of calculus; recovery.—Nashville Journal of Medicine and Surgery, 1889, XLIII, 133.

22. Brown, of Baltimore: Fifty-nine years; piece of No. 16 F. catheter; auto-catheterization; lateral cystotomy; three years; much deposit of calculous material; death.—Johns Hopkins Bulletin, 1892, III, 75.

23. Brown, B.: Twenty-seven years; leather shoestring; masturbation; lateral cystotomy; fifteen months; deposit of phosphates and carbonate of lime; recovery.—Journal of the American Medical Association, 1854, N. S., XXVIII, 393.

24. Browne, of Belfast: Fifty years; bone crochet-needle; masturbation; median cystotomy; two or three months; recovery.—Dublin Hospital Gazette, 1859, N. S., VI, 219.

25. Browne, G. B.: Sixty-five years; cork; to relieve incontinence of urine; lithotrity; seven months; recovery.—Transactions of the Medical Society of London 1894–95, XVIII, 378.

26. Browne, G. B.: Seventy years; piece of soft-rubber catheter; auto-catheterization; extracted with lithotrite after internal urethrotomy; about two months; deposit of phosphates; recovery.—Lancet, London, 1891, I, 769.

27. Browne, G. B.: Adult; home-made paraffin bougie; to relieve urethral irritation; extracted with lithotrite; six weeks; recovery.—British Medical Journal, 1888, I, 1382.

28. Bryant: Thirty-nine years; top of catgut bougie; being passed by patient; median cystotomy; two days; death.—Lancet, London, 1881, I, 456.

29. Bryant, J. D.: Sixteen years; tip of flexible catheter; being catheterized, not stated whether by doctor or not; median cystotomy; three years; formed nucleus of calculus; recovery.—New York Medical Record, 1892, XLII, 517.

30. Buchanan: Adult; gum catheter; during catheterization, not stated whether by doctor or not; withdrawn by specially-made instrument; nine months; calculous deposit; recovery.—London Medical Gazette, 1840, XXVI, 587.

31. Buck, Gurdon: Sixty years; piece of flexible catheter; during catheterization, not stated whether by doctor or not; extracted with lithotrite; twenty-two hours; no deposit; recovery.—New York Medical Record, 1869, 529.

32. Buck, Gurdon: Adult; piece of gutta-percha bougie; being passed for nocturnal emissions; lithotrity; four days; recovery.—Medical Times, New York, 1852, I, 39.

33. Byrd, W. A.: Seventy-one years; piece of Squire's vertebrated catheter; auto-catheterization; Bigelow's operation; twenty-two hours; no deposit; recovery.—Medical and Surgical Reporter, Philadelphia, 1884, L, 104.

34. Cadge, William: Twenty-five years; candle-wax; masturbation; extracted with lithotrite; eight months; calculous deposit; recovery.—British Medical Journal, 1873, II, 569.

35. Calloway: Eighteen years; piece of chalk with string; masturbation; median cystotomy; recovery.—Medical Times and Gazette, London, 1856, XIII, 213.

36. Campbell, G. W.: Twenty-one years; lead-pencil; to relieve urinary retention; lateral cystotomy; five weeks; uric-acid deposit; recovery.—London Medical Gazette, 1839–40, II, 435.

37. Casini, A.: Thirty-three years; piece of candle-wax; to relieve urethral irritation; median cystotomy; recovery.—Gior. Internat. d. Sc. Med., Napoli, 1891, N. S., XIII, 407.

38. Caudmont: Twenty-seven years; piece of pencil; extracted with lithotrite; recovery.—Bulletin de la Société Anatomie de Paris, 1848, XXIII, 362.

39. Chevalier, E.: Thirty-three years; rubber tube; extracted with forceps; three hours; no deposit; recovery.—Annales des Maladies des Organes Genito-Urinaires, Paris, 1890, VIII, 414.

40. Chevalier, E.: Adult; guide for internal urethrotomy; broke during internal urethrotomy; extracted with lithotrite; a few moments; none; recovery.—Annales des Maladies des Organes Genito-Urinaires, Paris, 1890, VIII, 414.

41. Chevalier, E.: Sixty-eight years; piece of rubber catheter; auto-catheterization; suprapubic cystotomy; recovery.—Annales des Maladies des Organes Genito-Urinaires, Paris, 1890, VIII, 414.

42. Chienne: Adult; whole soft-rubber catheter; auto-catheterization; extracted with lithotrite; twenty days; slightly coated with phosphates; recovery.—Edinburgh Medical Journal, 1881–82, XXVII, 744.

43. COCK: Adult; piece of parsley stem; to push back calculus gravel in urethra; perineal cystotomy; formed nucleus of phosphatic calculus; recovery.—Lancet, London, 1852, II, 442.

44. COCK: Adult; piece of gutta-percha bougie; being passed by patient; median cystotomy; sixteen days; somewhat incrusted; recovery.—Lancet, London, 1855, II, 493.

45. COCK: Forty-six years; piece of home-made gutta-percha bougie; being passed by patient; median cystotomy; fourteen days; phosphatic incrustation; recovery.—Medical Times and Gazette, London, 1856, XIII, 212.

46. COLLIS, M. H.: Fifty-six years; bone enema-tube; patient used it as a bougie; median cystotomy; recovery.—Dublin Quarterly Journal of the Medical Sciences, 1854, XVIII, 54.

47. COOTE, H.: Thirty years; piece of gutta-percha bougie; passed by patient; extracted with lithotrite; two weeks; recovery.—Medical Times and Gazette, London, 1858, XVI, 193.

48. COTTON, CHARLES: Twenty-four years; piece of gutta-percha bougie; passed by patient; extracted with lithotrite; three days; recovery.—Associated Medical Journal, London, 1854, 1053.

49. COULSON: Adult; piece of silver catheter; broke during catheterization, not stated by whom it was being passed; spontaneously; three weeks; recovery.—Medical Times and Gazette, London, 1856, XIII, 212.

50. CUTLER: Twenty-three years; fine glass tube; median cystotomy; three years; incrusted with phosphates; recovery.—Lancet, London, 1895, I, 185.

51. DARWIN: Adult; catgut bougie; passed by patient; macerated in the urine and passed spontaneously; four months; no deposit; recovery.—Memoirs of the Medical Society of London, 1792, III, 513.

52. DAVIDSON, D. M.: Adult; piece of vulcanized rubber catheter; auto-catheterization; perineal cystotomy; five months; formed nucleus of calculus; recovery.—Indian Medical Gazette, Calcutta, 1891, XXVI, 341.

53. DEMEL, THEODORE: Twenty-three years; pencil; lateral cystotomy; forty-two days; much incrusted; recovery.—Wiener medicinische Wochenschrift, 1863, XIII, 805.

54. DEPRES: Sixty-six years; hard-rubber sound; passed by patient; crushed calculous material and withdrew sound with lithotrite; three months; incrusted; recovery.—Gazette des Hôpitaux, Paris, 1879, LIII, 41.

55. DERBY, R. H.: Adult; piece of catheter; passed by a doctor; extracted with lithotrite; four weeks; somewhat incrusted; recovery.—Boston Medical and Surgical Journal, 1867, LXXVI, 171.

56. DILLSON, J. H.: Fifty-four years; piece of flexible catheter; auto-catheterization; extracted with Heurteloup's instrument; ten days; recovery.—American Journal of the Medical Sciences, Philadelphia, 1850, N. S., XX, 268.

57. DUBUC: Forty-nine years; piece of hard-rubber sound; passed by patient; spontaneously after internal urethrotomy; recovery.—Gazette des Hôpitaux, Paris, 1874, XLVII, 742.

58. DUNNING, L. H.: Fifty-seven years; cigarrette-holder; masturbation; extracted with lithotrite after internal urethrotomy; one month; recovery.—Medical Herald, Louisville, 1886, VIII, 57.

59. EBERMANN: Adult; two filiform bougies; passed by a doctor; extracted

with lithotrite; three months; recovery.—St. Petersburger medicinische Zeitschrift, 1871, II, 295.

60. EDWARDS, F. S.: Forty years; pilot bougie; passed by a doctor; extracted with lithotrite after internal urethrotomy; two days; incrusted with phosphates; recovery.—British Medical Journal, London, 1882, I, 816.

61. ELBEN: Adult; one inch of wire; extracted with lithotrite; three days; recovery.—Medicinische Correspondenzblatt der Würtemburg ärtzliche Verein, 1878, XLVIII, 220.

62. EVE, D.: Forty years; piece of slippery-elm bougie; passed by a doctor; bilateral cystotomy; two years; formed nucleus of a friable calculus; recovery.—Journal of Cutaneous and Genito-Urinary Diseases, New York, X, 397.

63. FENWICK, E. H.: Twenty-two; India-rubber umbrella ring; masturbation; found at autopsy; had symptoms of stone for three months prior to death; formed nucleus of stone; death.—Transactions of the Pathological Society of London, 1886–87, XXVIII, 193.

64. FENWICK, E. H.: Twenty-one years; paraffin taper; masturbation; extracted with lithotrite; recovery.—Transactions of the Medical Society of London, 1894, XVII, 341.

65. FERGUSSON, WILLIAM: Nineteen years; hard-rubber bougie; passed by patient; extracted with lithotrite; two months; some incrustation; recovery.—Lancet, London, 1863, II, 215.

66. FERGUSSON, WILLIAM: Adult; piece of gutta-percha bougie; passed by patient; lateral cystotomy; six months; slightly incrusted with phosphates; recovery.—Lancet, London, 1866, II, 9.

67. FLEMING, C.: Sixty years; gum-elastic catheter; passed by patient; specially-made forceps; twenty-four hours; no deposit; recovery.—Dublin Medical Press, 1863, L, 329.

68. FLEMING, C.: Thirty years; rubber bougie; passed by patient; specially-made forceps; six weeks; small phosphatic deposit; recovery.—Dublin Medical Press, 1863, L, 329.

69. FLEURY: Seventy-eight years; piece of metallic sound; passed by patient; passed through anus during straining at micturition; four days; no deposit; recovery.—Bulletin de la Société de Chirurgie de Paris, 1878, IV, 343.

70. FLEURY: Thirty-five years; cordwainer's awl; introduced by a comrade; bilateral cystotomy; twenty years; somewhat incrusted; recovery.—Bulletin de la Société de Chirurgie de Paris, 1878, IV, 391.

71. FORBES, W. S.: Fifty years; willow twig; passed by patient; litholapaxy; ten months; incrusted with phosphates; recovery.—Journal of the American Medical Association, November 28, 1896.

72. FOSTER, C.: Adult; bone tip of catheter; auto-catheterization; lateral cystotomy; one year; formed nucleus of phosphatic calculus; recovery.—Lancet, London, 1867, II, 194.

73. FURNER, W.: Forty-five years; black gum catheter; auto-catheterization; median cystotomy; twenty days; incrusted with phosphates; recovery.—Lancet, London, 1890, I, 542.

74. GAGE, HOMER: Twenty-three years; fragment of bougie; passed by a doctor; suprapubic cystotomy; one month; incrusted with phosphates; recovery.—Boston Medical and Surgical Journal, 1891, CXXIV, 132.

75. GARDE, H. C.: Forty-five years; threepenny piece; passed by patient to relieve incontinence of urine; extracted with lithotrite; two weeks; incrusted with phosphates; recovery.—Australasian Medical Gazette, Sydney, 1887–88, VII, 248.

76. GAYET: Adult; piece of pencil; introduced by patient; lateral cystotomy; several weeks; somewhat incrusted; recovery.—Lyon Médical, 1875, XIX, 518.

77. GIHON, A. L.: Thirty-one years; piece of pine-wood; introduced by patient; lateral cystotomy; two months; incrusted with phosphates; recovery.—Medical News, Philadelphia, 1888, LII, 233.

78. GILLON, G. G.: Forty-three years; piece of a bone pen-holder; introduced by patient to push back gravel; suprapubic cystotomy; three or four years; incrusted with phosphates and uric acid; recovery.—British Medical Journal, London, 1887, II, 239.

79. GOSSE, C.: Eighteen years; piece of flexible catheter; auto-catheterization; median cystotomy; twenty-four hours; no deposite; recovery.—Lancet, London, 1879, II, 545.

80. GOULD: Twenty-seven years; piece of stem of plant; introduced by patient; found at autopsy; formed nucleus of phosphatic calculus; death.—Boston Medical and Surgical Journal, 1858, LVIII, 100.

81. GOULD, A. P.: Adult; piece of rubber tubing; introduced by patient to give injection for gonorrhœa; extracted with lithotrite; recovery.—Transactions of the Medical Society of London, 1894, XVII, 341.

82. GOULEY: Twenty-six years; cylindrical piece of potato; masturbation; extracted with Heurteloup's instrument; three days; incrusted with phosphates; recovery.—New York Medical Journal, January 2, 1897.

83. GOULEY: Sixty-five years; piece of flexible catheter; auto-catheterization; extracted with Mercier's instrument; some hours; no deposit; recovery.—New York Medical Journal, January 2, 1897.

84. GREGORY: Seventy-three years; piece of silver catheter; auto-catheterization; crushed calculous material off with lithotrite, but left fragment of catheter in bladder; several years; formed nucleus of calculus; recovery.—Humboldt Medical Archives, St. Louis, 1868, II, 280.

85. GRIEG: Thirty-three years; piece of sealing wax; masturbation; lithotrity; over one month; incrusted with phosphates; recovery.—Edinburgh Medical Journal, 1868, XIV, 312.

86. GROSS, S. D.: Thirty-nine years; piece of a pencil; introduced by patient, who suffered from gravel; lateral cystotomy; one month; slight uric acid deposit; recovery.—North American Medico-Chirurgical Review, Philadelphia, 1857, I, 413.

87. HALDERMAN, D.: Thirty years; piece of rubber tubing; masturbation; lateral cystotomy; twelve days; slight earthy deposit; recovery.—Columbus Medical Journal, 1884–85, LIII, 403.

88. HALSTED, W. S.: Thirty-five years; piece of flexible catheter; auto-catheterization; lateral cystotomy; six or eight months; three small calculi each with a piece of the catheter as a nucleus; recovery.—New York Medical Journal, 1884, XXXIX, 227.

89. HAMILTON, E.: Thirty-four years; home-made gutta-percha catheter; auto-catheterization; median cystotomy; three and a half months; recovery.—Medical Press and Circular, London, 1872, XIII, 359.

90. HAMILTON: Forty-seven years; feather; introduced by patient to relieve

urethral irritation; perineal cystotomy; six months; five calculi, the nucleus of each being a piece of the feather; recovery.—Medical Times and Gazette, London, 1865, I, 146.

91. HANKE: Fifty-three years; ear-spoon; introduced by patient's wife; perineal cystotomy; many years; much incrusted; recovery.—Journal der Chirurgie und Augenheilkunde, Berlin, 1835, XXIII, 497.

92. HARD, A.: Seventy years; piece of English catheter; auto-catheterization; extracted by specially-made screw on the end of a piece of wire; some hours; no deposit; recovery.—Transactions of the Minnesota Medical Society, 1881, 78.

93 HARRISON, R.: Thirty-eight years; pencil case; introduced by a woman; extracted with lithotrite; some hours; no deposit; recovery.—Lancet, London, August 11, 1897.

94. HARVEY: Twenty-five years; piece of hard-rubber catheter; introduced by a doctor; suprapubic cystotomy; four days; no deposit; died nineteen days after operation of pulmonary phthisis.—Clinique, Chicago, 1894, XV, 249.

95. HAWKINS, CÆSAR: Fifty-eight years; piece of gutta-percha catheter; auto-catheterization; extracted with lithotrite; recovery.—London Medical Gazette, 1849, IX, 699.

96. HEATH, C.: Seventy-one years; piece of silver catheter; auto-catheterization; median cystotomy; five days; recovery.—British Medical Journal, 1879, I, 628.

97. HEURIET: Thirty-seven years; metal cap, four centimetres long; lithotrity; formed nucleus of phosphatic calculus; recovery.—Annales des Maladies des Organes Genito-Urinaires, Paris, 1883–84, II, 235.

98. HEURIET: Sixty-five years; piece of filiform bougie; introduced by a doctor; lithotrity; last crushing six months after introduction; recovery.—Annales des Maladies des Organes Genito-Urinaires, Paris, 1883–84, II, 235.

99. HEURIET: Seventy years; piece of rubber sound; introduced by patient; extracted part of it by lithotrite, the rest passed spontaneously; recovery.—Annales des Maladies des Organes Genito-Urinaires, Paris, 1883–84, II, 235.

100. HILDEBRANDT: Sixty-five years; piece of rubber drainage-tube; attempting auto-catheterization; lateral cystotomy; six weeks; recovery.—Münchener medicinische Wochenschrift, 1890, XXXVII, 441.

101. HILTON: Adult; piece of English catheter; auto-catheterization; extracted with lithotrite; recovery.—Medical Times and Gazette, London, 1858, XVI, 630.

102. HUNT, WILLIAM: Boy; galvanized metallic watch-chain; masturbation; spontaneously; few hours; no deposit; recovery.—Philadelphia Medical Times, 1872.

103. HUTCHINSON, J. C.: Thirty years; lead-pencil; masturbation; bilateral cystotomy; four days; no deposit; recovery.—Medical Press and Circular, London, 1869, VII, 113.

104. HUTCHINSON: Thirty years; piece of gutta-percha bougie; introduced by patient; spontaneous; three days; no deposit; recovery.—Medical Times and Gazette, London, 1856, XIII, 213.

105. INGALLS: Adult; glass tobacco-pipe-stem; patient introduced it to empty bladder; lateral cystotomy; twelve days; no depesit; recovery.—Boston Medical and Surgical Journal, 1879, CI, 780.

106. VON IVANCHIEH: Twenty-six years; piece of gutta-percha bougie; intro-

duced by patient; extracted with forceps; some hours; no deposit; recovery.—Wiener medicinische Wochenschrift, 1854, IV, 705.

107. JACKSON, J. C.: Adult; piece of wire; lateral cystotomy; two months; nucleus of phosphatic calculus; recovery.—Transactions of the Pathological Society of London, 1869, XX, 237.

108. JEAFFRESON, C. S.: Adult: piece of flexible catheter; left in by a doctor; extracted with lithotrite; two years; phosphatic deposit; recovery.—Lancet, London, 1872, I, 252.

109. JOBERT: Forty-two years; pipe-stem; attempt at auto-catheterization; lithotrity; six weeks; phosphatic deposit; recovery.—Gazette des Hôpitaux, Paris, 1850, p. 105.

110. JOHNSON, W.: Adult; soft rubber catheter; introduced by a layman; caught part projecting into urethra on tip of sound of small calibre; some hours; no deposit; recovery.—British Medical Journal, 1889, I, 793.

111. JONES, T.: Forty-eight years; lead-pencil; masturbation; median cystotomy; recovery.—Canada Medical Journal, Montreal, 1867, III, 449.

112. KEEN, W. W.: Seventy-five years; piece of flexible catheter; auto-catheterization; lateral cystotomy; six days; no deposit; recovery.—Medical News, Philadelphia, January 14, 1888.

113. KOLLOCK: Eighteen years; slate-pencil; lateral cystotomy; formed nucleus of phosphatic calculus; recovery.—Transactions of the South Carolina Medical Association, 1829.

114. LANE: Forty-nine years; piece of gutta-percha catheter; auto-catheterization; median cystotomy; one day; no deposit; recovery.—Medical Times and Gazette, London, September 13, 1856.

115. LEDIARD, H. A : Seventy-two years; piece of silver catheter; being introduced by a layman; median cystotomy; two or three days; none; recovery.—British Medical Journal, 1882, II, 889.

116. LEDIARD, H. A.: Adult; gutta-percha bougie; introduced by patient; extracted with lithotrite; recovery.—British Medical Journal, 1882, II, 889.

117. LEONARD, B. B.: Forty-one years; head of wheat; got into urethra while patient was cutting wheat; lateral cystotomy; six months; some concretion formed about it; recovery.—Cincinnati Lancet and Obstetrician, 1872, N. S., XV, 429.

118. LOWE, J.: Nineteen years; bone pen-holder; introduced by patient to relieve retention due to gravel; lateral cystotomy; two years; recovery.—Lancet, London, 1879, I, 154.

119. LUND, E.: Seventeen years; rubber tube from nursing-bottle; lateral cystotomy; recovery.—British Medical Journal, 1869, II, 119.

120. MAISONNEUVE: Twenty-seven years; kidney bean; masturbation; extracted with lithotrite; three months; incrusted with ammonio-magnesium salts; recovery.—Moniteur des Hôpitaux, Paris, 1853, I, 11.

121. MALHERBE, A.: Sixty-five years; rubber sound; introduced by a doctor; extracted with brisée pierre; recovery.—Annales des Maladies des Organes Genito-Urinaires, Paris, February, 1895.

122. MALHERBE, A.: Forty-eight years; piece of a rubber sound; introduced by patient; extracted with brisée pierre; twenty-four hours; no deposit; recovery.—Annales des Maladies des Organes Genito-Urinaires, Paris, February, 1895.

123. MAUNSELL, H. W.: Eighteen years; twig of wood; masturbation; suprapubic cystotomy; nine weeks; recovery.—Transactions of the International Medical Congress, Australasia, 1887, I, 157.

124. MAYO, H.: Thirty-nine years; piece of flexible catheter; introduced by a doctor; lateral cystotomy; thirteen weeks; much incrusted; recovery.—London Medical and Physical Journal, 1830, N. S, IX, 136.

125. MAXWELL, R. T.: Adult; pine-leaf; masturbation; spontaneously; a few days; deposit of phosphates; recovery.—Transactions of the South Carolina Medical Association, 1870, 15.

126. MAXWELL, R. T.: Adult; piece of gutta-percha bougie; introduced by patient; lateral cystotomy; three and a half weeks; deposit of phosphates; recovery.—American Journal of the Medical Sciences, Philadelphia, 1857, XXXIII, 67.

127. MCRUER: Fifty years; tobacco-pipe-stem; introduced for strangury by patient; median cystotomy; ten days; recovery.—Boston Medical and Surgical Journal, 1861, LXIV, 205.

128. MCWHINNIE: Twenty-six years; piece of sealing-wax; introduced for urethral irritation by patient; perineal cystotomy; four years; death.—Medical Times and Gazette, London, 1856, N. S., XIII, 591.

129. MELDON, A.: Thirty years; No. 1 flexible catheter; not stated by whom introduced, but used for retention of urine; lateral cystotomy; nine months; formed nucleus of calculus; recovery.—Medical Press and Circular, London, 1883, XXXV, 249.

130. MERRILL, J. W., Jr.: Thirty-five years; piece of English catheter; introduced by a doctor; extracted with lithotrite; one month; deposit of uric acid and phosphates, also oxalate of lime; recovery.—Boston Medical and Surgical Journal, 1883, CIX, 174.

131. MONKS, G. H.: Adult: lead-pencil with rubber in metal cap; masturbation; median cystotomy; six months; recovery.—Boston Medical and Surgical Journal, 1891, CXXIV, 182.

132. MORITZ: Thirty-four years; glass tube; lithotrity; three months; recovery.—St. Petersburger medicinische Zeitschrift, 1875, V, 156.

133. MURDOCH: Thirty years; lead-pencil; masturbation; median cystotomy; four days; no deposit; recovery.—Pittsburg Medical Journal, 1883, III, 65.

134. MUSSEY: Adult; piece of cord; to allay urethral irritation, by patient; perineal cystotomy; five months; formed nucleus of calculus; recovery.—American Journal of the Medical Sciences, Philadelphia, 1854, XXVIII, 393.

135. NANCREDE, C. B.: Adult; pen-holder; perineal cystotomy; no deposit; recovery.—Philadelphia Medical Times, 1880–81, XI, 55.

136. NEWELL, T.: Thirty-five years; gum-elastic catheter; auto-catheterization; spontaneously; ninety-six hours; no deposit; recovery.—Transactions of the Rhode Island Medical Society, 1877–78, 18.

137. NICOLADONI: Eighteen years; pin; suprapubic cystotomy; one day; no deposit; recovery.—Wiener medicinische Wochenschrift, 1886, XXXVI, 205.

138. NORRIS, HENRY: Adult; piece of straw; introduced by patient to relieve urethral irritation; found at autopsy; one month; formed nucleus of calculus; death.—Guy's Hospital Reports, 1840, V, 241.

139. NOTT, J. C.: Thirty-four years; piece of wax; masturbation; lateral cystotomy; five months; formed eight calculi but no wax; death.—New Orleans Medical and Surgical Journal, 1858, XV, 183.

140. Otis, F. W.: Seventy years; piece of straw; litholapaxy; formed nucleus of calculus; recovery.—Medical Gazette, New York, 1880, vii, 181.

141. Oviatt: Twenty-six years; medicated gelatin bougie; introduced by patient; lateral cystotomy; twenty months; formed nucleus of calculus; recovery. —North American Practitioner, Chicago, 1892, 435.

142. Packard, F. R.: Twenty-seven years; vulcanized rubber watch-chain bar; masturbation; median cystotomy; fourteen years; slight phosphatic deposit; recovery.

143. Packard, J. H.: Adult; shawl-pin; suprapubic cystotomy; formed nucleus of a stone; recovery.

144. Parker, F. L.: Sixteen years; two gutta percha bougies; masturbation; median cystotomy; three or four months; uric acid deposit; recovery.—Transactions of the South Carolina Medical Association, 1883, 93.

145. Parker, Willard: Twenty-eight years; piece of slippery-elm bougie; introduced by patient; lateral cystotomy; three months; incrustation of phosphates; recovery.—New York Medical Gazette, 1841–42, i, 21.

146. Pertsch: Adult; piece of wax; median cystotomy; ten days; recovery. —Breslau Aertzl. Zeitschrift, 1887, ix, 157.

147. Picault: Adult; piece of gutta-percha bougie; introduced by patient; spontaneously; a few days; no deposit; recovery.—British-American Journal, Montreal, 1861, iii, 543.

148. Pitha: Adult; lead-pencil; introduced by patient for stricture; lateral cystotomy; eight days; recovery.—Wiener medicinische Wochenschrift, 1858, 865.[1]

149. Pitha: Adult; piece of sealing-wax used to lengthen catheter; autocatheterization; extracted with lithotrite; recovery.—Wiener medicinische Wochenschrift, 1858, 865.[1]

150. Porter, C. B.: Sixty-four years; piece of soft rubber catheter; autocatheterization; extracted with lithotrite; sixteen hours; no deposit; recovery.—Boston Medical and Surgical Journal, 1884, cx, 349.

151. Porter, G. H.: Twenty-five years; piece of gutta-percha bougie; introduced by patient; Allarton's cystotomy; seven months; some calculous formation; recovery.—Dublin Quarterly Journal of the Medical Sciences, 1873, lv, 110.

152. Porter, G. H.: Thirty-eight years; piece of flexible catheter; autocatheterization; median cystotomy; nine weeks; much incrusted; recovery.—Dublin Quarterly Journal of the Medical Sciences, 1873, lv, 110.

153. Porter, G. H.: Forty-five years; piece of flexible catheter; autocatheterization; extracted with lithotrite; twenty-four hours; no deposit; recovery.—Dublin Quarterly Journal of the Medical Sciences, 1873, lv, 110.

154. Porter, G. H.: Twenty-three years; piece of gutta-percha bougie; introduced by patient; median cystotomy; seven months; formed nucleus of stone; recovery.—Medical Press and Circular, 1869, vii, 113.

155. Post, A.: Adult; lead-pencil; introduced by patient to relieve urethral irritation; passed into urethra and was then removed with forceps; three months; no deposit; recovery.—Boston Medical and Surgical Journal, 1881, civ, 165.

156. Post, A. C.: Adult; gutta-percha bougie; introduced by a doctor; lateral cystotomy; recovery.—New York Medical Times, 1852, i, 39.

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[1] These operations were performed on the same patient.

157. PURCELL, F. A : Adult; piece of soft rubber catheter; auto-catheterization; spontaneously; four days; no deposit; recovery.—Dublin Quarterly Journal of the Medical Sciences, 1867, LXIV. 488.

158. QUAIN, R.: Adult; piece of gutta-percha bougie; introduced by patient; median cystotomy; three days; no deposit; recovery.—Association Medical Journal, London, 1854, II, 997.

159. RICHARDSON, M. H.: Thirty-six years; wooden pencil with metal cap; introduced by patient to relieve urethral irritation; extracted with lithotrite; fourteen weeks; some incrustation; recovery.—Boston Medical and Surgical Journal, 1889, CXXI, 630.

160. ROBERTS, J. A.: Adult; piece of silver catheter; auto-catheterization; perineal cystotomy; recovery.—Medical and Surgical Reporter, Philadelphia, 1860, IV, 3.

161. ROBERTS, J. A.: Adult; piece of silver catheter; auto-catheterization; lateral cystotomy; recovery.—Medical and Surgical Reporter, Philadelphia, 1860, IV, 3.

162. ROBERTSON: Adult; wooden pen-holder; introduced by patient for stricture; median cystotomy; three days; no deposit; recovery.—Pacific Medical and Surgical Journal, 1871–72, V, 65.

163. ROGERS, W. B.: Thirty-six years; piece of wire; lateral cystotomy; one year; phosphatic deposit; recovery.—Mississippi Valley Medical Monthly, 1885, V, 385.

164. RORIG: Adult; piece of Mercier's catheter; auto-catheterization; extracted with lithotrite; recovery.—Therapeutische Monatschrift, Berlin, 1890, IV, 401.

165. RORIG: Adult; piece of Mercier's catheter; auto-catheterization; extracted with lithotrite; recovery.—Therapeutische Monatschrift, Berlin, 1890, IV, 401.

166. RORIG: Adult; piece of Mercier's catheter; auto-catheterization; extracted with lithotrite; recovery.—Therapeutische Monatschrift, Berlin, 1890, IV, 401.

167. RORIG: Adult; piece of Mercier's catheter; auto-catheterization; extracted with lithotrite; recovery.—Therapeutische Monatschrift, Berlin, 1890, IV, 401.

168. RORIG: Adult; piece of Mercier's catheter; auto-catheterization; extracted with lithotrite; recovery.—Therapeutische Monatschrift, Berlin, 1890, IV, 401.

169. ROSE, L. W.: Fifty-eight years; leather shoestring; masturbation; extracted with lithotrite; phosphatic deposit; recovery.—Medical Record, New York, 1887, XXXII, 761.

170. ROSE, WM.: Fifty-four years; clay tobacco-pipe-stem; introduced by patient; extracted with lithotrite scoop; four days; no deposit; recovery.—Lancet, London, 1879, I, 84.

171. ROSS, G.: Adult; kidney bean; introduced by comrade; extracted with lithotrite; two weeks; recovery.—Canada Medical and Surgical Journal, Montreal, 1875, XVI, 445.

172. ROTHMUND, A.: Sixty-five years; piece of filiform bougie; extracted with lithotrite; recovery.—Deutsche Klinik, Berlin, 1859, XI, 159.

173. SAMAIN: Thirty-eight years; kidney bean; extracted with brisée pierre; three months; recovery.—Journal de la Société médicale, Lille, June 16, 1894.

174. SEGALAS: Sixty-two years; gum-elastic bougie; introduced by patient; lithotrity; forty-eight hours; no deposit; recovery.—Bulletin de la Académie de Médecine, Paris, 1837–38, II, 48.

175. SERVIER: Twenty-three years; piece of steel; introduced by patient to allay urethral irritation; median cystotomy; several weeks; recovery.—Gazette hebdomadaire de Médecine, Paris, 1869, 2 S., VI, 518.

176. SHRADY: Adult; soft rubber catheter; introduced by a doctor; extracted with lithotrite; recovery.—Medical Record, New York, 1892, XLII, 517.

177. SIMON: Four years; sewing-needle; accidentally introduced while being dandled by a woman; perineal cystotomy; some years; formed nucleus of a calculus; recovery.—Transactions of the Pathological Society of London, 1855, VI, 255.

178. SIMON: Sixty-two years; piece of gutta-percha bougie; introduced by patient; lateral cystotomy; two days; no deposit; died one month later of apoplexy.—Transactions of the Pathological Society of London, 1855, VI, 255.

179. SMITH, A. H.: Adult; flexible catheter; auto-catheterization; spontaneously; a few hours; no deposit; recovery.—Medical Record, New York, 1892, XLII, 517.

180. SMITH, GEORGE: Twenty-four years; glass tube; masturbation; lateral cystotomy; one day; recovery.—Medical Record, New York, 1874, IX, 117.

181. SMITH, H.: Thirty-nine years; piece of straw; introduced by patient to relieve retention; litholapaxy; some months; formed nucleus of a calculus; recovery.—Lancet, London, 1883, I, 545

182. SMITH, HENRY: Nineteen years; glass tube; introduced by patient to relieve urethral irritation; median cystotomy; one day; no deposit; recovery.—Lancet, London, 1866, II, 9.

183. STEINER, F.: Sixty-three years; piece of rolled-up paper; found at autopsy; upward of six months; formed nucleus of a calculus; death.—Wiener medicinische Wochenschrift, 1868, XVIII, 745.

184. STEINITZ, J.: Adult; fragment of rubber catheter; auto-catheterization; spontaneous after dilatation of stricture of urethra; seventeen years; recovery.—Breslau Aertzl. Zeitschrift, 1879, I, 24.

185. STOKES, WM.: Forty years; flexible catheter; auto-catheterization; median cystotomy; one day; no deposit; recovery.—Dublin Quarterly Journal of the Medical Sciences, 1873, LVI, 231.

186. SWINFORD: Adult; piece of grass; extracted with lithotrite; recovery.—Transactions of the Medical Society of London, 1894, XVII, 341.

187. TALBOT, J. T.: Seventy-one years; flexible catheter; auto-catheterization; suprapubic cystotomy; two days; no deposit; recovery.—New England Medical Gazette, 1853, IV, 289.

188. TALBOT, J. T.: Seventy-two years; piece of silver catheter; auto-catheterization; extracted with specially-devised hook; recovery.—New England Medical Gazette, 1853, IV, 289.

189. THOMPSON, HENRY: Sixty-three years; hair-pin; passed to relieve urethral irritation; extracted with lithotrite; a few hours; no deposit; recovery.—Lancet, London, 1866, II, 9.

190. THOMPSON, HENRY: Adult; piece of sealing-wax; introduced by patient; median cystotomy; six months; formed nucleus of phosphatic calculus; recovery.—Catalogue to Collection of Calculi of the Bladder, etc., 1893.

191. THOMPSON, HENRY: Adult; piece of vulcanized rubber catheter; auto-catheterization; crushed and withdrawn with lithotrite; formed nucleus of phosphatic calculus; recovery.—Catalogue to Collection of Calculi of the Bladder, etc., 1893.

192. THORBURN: Fifty-four years; piece of tobacco-pipe-stem; introduced by patient for retention of urine; median cystotomy; one day; no deposit; recovery.—London Medical Gazette, 1828–29, III, 822.

193. TODD, T. M.: Forty-nine years; piece of glass rod; masturbation; median cystotomy; recovery.—Occidental Medical Times, Sacramento, 1892, VI, 435.

194. TRELAT: Forty-one years; stem of feather; introduced by patient for retention of urine; median cystotomy; six months; covered with phosphates; recovery.—Bulletin de la Société Anatomie de Paris, 1878, LI, 352.

195. TREVOR, J. E: Adult; flexible catheter; suprapubic cystotomy; four months; covered with phosphates; recovery.—Lancet, London, 1890, I, 539.

196. TROWBRIDGE, AMASA: Adult; piece of sealing-wax; lateral cystotomy; twenty-two days; covered with phosphates; recovery.—New York Medical Gazette, 1853, IV, 289.

197. TROWBRIDGE, AMASA: Sixteen years; piece of slate-pencil; lateral cystotomy; three weeks; recovery.—New York Medical Gazette, 1853, IV, 289.

198. TROWBRIDGE, AMASA: Twenty-three years; piece of willow-twig; lateral cystotomy; two years; formed nucleus of a calculus; recovery.—New York Medical Gazette, 1853, IV, 289.

199. VAN BUREN, W. H.: Twenty years; piece of slate-pencil; introduced by a comrade; lateral cystotomy; five years; formed nucleus of a calculus; recovery.—New York Medical Times, 1854, III, 225.

200. VAN BUREN, W. H.: Adult; wheat straw; introduced by patient; lateral cystotomy; many years; formed nucleus of a calculus; death from pyæmia.—Transactions of the New York Pathological Society, 1879, III, 229.

201. VIERTEL: Adult; piece of Nélaton catheter; auto-catheterization; suprapubic cystotomy; two years; formed nucleus of a calculus; recovery.—Deutsche medicinische Wochenschrift, Leipzig und Berlin, 1893, XIX, 503.

202. VON DITTEL: Sixty-six years; piece of a catheter; auto-catheterization; suprapubic cystotomy; twenty-seven days; recovery.—Wiener medicinische Blätter, 1881, IV, 1280.

203. VON FILLENBAUM: Fifty-four years; piece of Nélaton catheter; auto-catheterization; extracted with lithotrite; three days; no deposit; recovery.—Deutsche Zeitschrift für Chirurgie, Leipzig, 1884, XX, 453.

204. VON FILLENBAUM: Thirty years; pencil with bone tip; masturbation; median cystotomy; three days; recovery.—Militärarzt, Wien, 1881, XV, 109.

205. WALKER, G. E.: Forty-seven years; piece of bougie; introduced by patient; spontaneous; recovery.—British Medical Journal, 1880, I, 278.

206. WALLACE, D.: Forty-five years; piece of paraffin; introduced by patient for urethral irritation; litholapaxy; one year; phosphatic deposit; recovery.—Lancet, London, 1893, I, 1132.

207. WEICKERT: Twenty-five years; piece of bougie; introduced by patient; spontaneous; recovery.—Deutsche Klinik, Berlin, 1853, V, 244.

208. WEISS, W.: Adult; piece of steel; perineal cystotomy; death thirteen weeks after operation.—Wiener medicinische Wochenschrift, 1873, XXIII, 661.

209. WEISS: Forty-two years; piece of rubber tube; introduced by patient for retention of urine; median cystotomy; recovery.—Aertzliche Berliner der Klinik allgemeine Krankenheiten zu Prag., 1878, 149.

210. Weiss: Adult; piece of flexible catheter; auto-catheterization; extracted with lithotrite; eight days; recovery.—Aertzliche Berliner der Klinik allgemeine Krankenheiten zu Prag., 1878, 149.

211. Wheeler, H. M.: Twenty-one years; button-hook; spontaneously; ten days; no deposit; recovery.—Physician and Surgeon, Ann Arbor, 1879, I, 262.

212. Wier, Wm.: Forty-five years; piece of woodbine; introduced by patient to relieve urethral irritation; lateral cystotomy; ten months; formed nucleus of phosphatic calculus; recovery.—London and Edinburgh Monthly Journal of the Medical Sciences, 1843, III, 1005.

213. Wight, J. S.: Forty-one years; piece of soft catheter; introduced by a doctor; lateral cystotomy; fifteen days; much incrusted; recovery.—Brooklyn Medical Journal, New York, 1890, IV, 581.

214. Wight, J. S.: Forty-five years; piece of soft catheter; auto-catheterization; perineal cystotomy; eighteen months; much incrusted; death from dysentery while convalescing from operation.—Brooklyn Medical Journal, New York, 1890, IV, 561.

215. Wildbore, F.: Fifty-three years; piece of soft catheter; auto-catheterization; lateral cystotomy; four weeks; formed nucleus of phosphatic calculus; recovery.—Lancet, London, June 27, 1846.

216. Williams: Thirty-six years; brass lead-pencil guard; lateral cystotomy; two years; deposit of uric acid phosphates forming a calculus; recovery.—Lancet, London, 1892, II, 484.

217. Williamson: Twenty-five years; piece of cane; passed by comrades; lateral cystotomy; two years; formed nucleus of phosphatic calculus; recovery.—Edinburgh Medical and Surgical Journal, 1848, LXIX, 63.

218. Wilson, H. C.: Forty-two years; piece of English web catheter; auto-catheterization; litholapaxy; eight months; formed nucleus of phosphatic calculus; recovery.—Medical Record, New York, 1882, XXII, 709.

219. Wishard, W. N.: Adult; piece of chewing-gum; introduced by patient to allay urethral irritation; median cystotomy; two months; phosphatic deposit; recovery.—Indiana Medical Journal, 1894, XIII, 178.

220. Wishard, W. N.: Adult; cane pipe-stem; median cystotomy; nine months; phosphatic deposit; recovery.—Indiana Medical Journal, 1894, XIII, 178.

221. Wyeth, J. A.: Adult; English catheter; auto-catheterization; extracted with lithotrite; recovery.—New York Medical Record, April 7, 1883.

Addendum.

222. Morton, T. G.: Twenty-three years; piece of carpenter's lead-pencil; median cystotomy; some weeks; deposit of calculous material; recovery.—Pennsylvania Hospital Reports, Vol. II, 44.

223. Keen, W. W.: (Unpublished); 60; fragment of rubber catheter; auto-catheterization; suprapubic cystotomy; three days; recovery.

PRELIMINARY TRACHEOTOMY IN OPERATIONS UPON THE UPPER AIR-PASSAGES.[1]

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IN this brief paper I desire to call attention to the consideration of tracheotomy as preliminary to operations for the removal of tumors and malignant disease of the upper air-passages. Such operations include the removal of polypi of the naso-pharynx, the removal of tumors starting from the tongue, tonsils, and pharynx, and, finally, the extirpation, partial or complete, of the tongue, upper and lower jaw or larynx, respectively. These operations are accompanied with more or less risk, and the safe and complete removal of the diseased parts is at times attended with great difficulties. The space one has to work in is small, is in close proximity to large vessels and nerves, and in order to satisfactorily expose and remove the disease we may be compelled to remove important structures, as well as to resort to extensive and careful dissections. Owing to the natural vascularity of the parts, these operations are more or less bloody, and our efforts must be directed to limiting as far as possible the amount of hæmorrhage, but, particularly, to preventing the possibility of the blood making its way into the trachea. Another danger to be avoided is sepsis, which may occur in the wound, especially in the cases of operation upon the mouth or pharynx, or, again, septic material may be inhaled into the lung, and thus facilitate the occurrence of septic bronchitis or pneumonia. Finally, the mode of administering the anæsthetic plays an important part, particularly in long operations where complete narcosis is very desirable. How to prevent the aspiration of blood during the operation was the problem for many years, and to Trendelenburg is due the credit of being the first to give us a satisfactory solution, when he presented his well-known tampon cannula. At the present time, when one employs the preliminary operation, he has the choice of two methods, he can open the trachea and insert one of the various tampon cannulæ, which we now have at our disposal, or he can insert an ordinary tracheotomy-tube, and then tampon the pharynx with sterile sponges or sterile gauze. The advantages claimed for the preliminary operation, whatever the method adopted, are, first, it prevents the entrance of blood and septic matter into the trachea ; second, it admits of a continuous and convenient administration of the anæsthetic, and thus permits of a complete and satisfactory operation. The possibility of the entrance of considerable blood into the trachea is a danger peculiar to these cases, and it calls for every precaution on the part of the surgeon to avoid its occurrence. Should such an accident happen, sudden death by asphyxia may follow,—and not a few cases of the kind have been reported,—or, if the patient be rescued by prompt tracheotomy, he may later succumb to septic pneumonia. While the degree of danger no doubt depends on the quantity of blood which may gain access to the trachea, still, it is not impossible that the entrance of even a small amount may be very disastrous. The liability of the aspiration of blood is increased in operations requiring considerable time, and where complete anæsthesia, together with a recumbent position of the patient is of advantage, and it is in this class of cases that the preliminary measure can be used with the greatest advantage. Of equal, if not of greater, importance is the prevention of septic matter entering the lung, as it is well known that a large percentage of deaths subsequent to operation is due to this cause. It is not the entrance of pure blood into the lungs that causes septic pneumonia, but of blood mixed with septic discharges from the mouth and throat, or of blood pure to start with, but contaminated later by the inhalation of septic material from the wound or from the dressings. It is evident, therefore, that the successful prevention of septic pneumonia depends not merely in excluding septic matter during operation, but more particularly on a most careful and painstaking after-treatment of the wound. Owing to the presence of germs in the mouth and pharynx, the secretions of these cavities are more or less septic, and are also increased in amount after operations in these regions. As a result, the tampons or dressings soon become saturated unless frequently changed, thus facilitating the contamination of the wound surface and the entry of septic secretions into the trachea by way of the larynx.

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[1] Read before the New York Surgical Society, February 24, 1897.

Should the saturation extend to the outer dressing, the chances of inhalation of the germ products through the tracheotomy-tube are increased. It is consequently highly essential that, in order to avoid sepsis, the tamponnade should be carefully applied and frequently changed. In carrying out these conditions, which a successful after-treatment imposes on us, the preliminary operation is of the greatest assistance, if not a necessity, and this, it seems to me, is one of its chief advantages. The continuous administration of the anæsthetic through the tube is of great convenience, as it leaves the field of operation clear, and it enables the surgeon to work quickly and without interruption, and thus saves time. It admits of a better control of hæmorrhage, particularly in long operations where bleeding surfaces have to be controlled by the continuous pressure of sponges or pads. Where the anæsthetic under similar circumstances is administered by the mouth and nose, the loss of blood may be very great, as the necessary pressure on the bleeding-points cannot be continuous, and is frequently interrupted by the repeated administrations of the anæsthetic. By far the great majority of the operations to which tracheotomy is preliminary are those for the removal of malignant growths. In order to prevent or delay recurrence, it is absolutely necessary, when possible, that all infected tissues should be removed; not only the tumor itself, together with the margin of healthy tissue around it, but also the lymphatic vessels and glands in the same region. This requires free dissections to satisfactorily expose and remove the disease, a careful ligation of many vessels, the avoidance of injury of large nerves and other important structures; in short, an operation which allows a deliberate and complete removal of the infected tissues. Here, it seems to me, we find one of the strongest points in favor of the preliminary measure, as it enables us to meet the indications in a satisfactory and a safe manner. Having decided on the preliminary operation, the question as to which method is preferable is of interest. Shall we use the tampon cannula, or shall we insert an ordinary tube and tampon the pharynx? The answer, I think, depends partly on the individual preference of the surgeon, and partly on the location of the disease. Owing to the objections which pertain to the Trendelenburg tube, many have rejected it in favor of the other method, while others employ the modifications of the original instrument. In operations involving the upper jaw, tongue, tonsils, or upper pharynx respectively, either method is of use, but in these cases my preference is for the ordinary tracheotomy-tube, combined with tamponnade of the pharynx. It allows of a smaller wound of the trachea, and when the pharynx is carefully packed with sterile gauze, it is equally effective in excluding blood and septic matter from the trachea. An objection to the tampon cannula is that it permits blood and septic secretions to lodge in the larynx and in that portion of the trachea above the tampon, and when later on the tampon cannula is replaced by the ordinary tube, this undesirable material may find its way into the lung. The space is small, to be sure, and the possibility of its causing septic pneumonia may be very remote, but it seems to me it is worthy of consideration. In total extirpation of the larynx or of the lower pharynx, together with the larynx, the tampon cannula is indicated. Trendelenburg's cannula is open to several objections; it is a rather complicated instrument, the rubber bag is liable to rupture or collapse, and persistent cough may follow distention of the bag. Hahn's cannula, in which the outer tube is covered by a layer of compressed sponge, is a serviceable instrument, and is widely used. It requires, however, rather an elaborate preparation of the sponge before it is compressed, and at times it has failed to effect a complete tamponnade of the trachea. Another sponge cannula is that of Kocher, in whose clinic it has been used with constant success. A small sponge is fastened by strong silk into two grooves running around the outer tube near the lower extremity, and the manner of fastening is such that the sponge appears like an open umbrella, its concave surface looking upward. The instrument is simple, easily prepared, and apparently free from objection. Another excellent modification of Trendelenburg's tube is that of Gerster.

An interesting point is the time when the preliminary operation should be performed. Many, and perhaps the majority of surgeons, favor the preliminary preceding the major operation by several days, and some insist that it should be done some weeks beforehand. The advantages claimed are several,—that time is saved at the subsequent operation; the patient becomes better accustomed to breathing through the tube; he can be more conveniently anæsthetized; there is less danger of subsequent pneumonia; and, finally, it allows debilitated patients to gain strength and be better prepared for the operation to come. In deciding this question, it seems to me, that we should be guided by the general condition of the patient. Where his health is greatly impaired as a result of the chronic carbonic acid intoxication due to an insufficient supply of oxygen through obstruction of the air-passages, and in most cases the obstruction is in the larynx, the advantage of preliminary operation some days beforehand is very evident. The benefit derived is twofold: it permits the gaining of strength, and it may cure, or at least favorably influence, the bronchitis which so often exists. The opinion that, by performing the preliminary step some days beforehand, the danger of subsequent pneumonia is lessened, I hardly think is tenable, as it has been proven that the prevention of sepsis depends largely on the successful after-treatment of the wound. When a patient is strong and in good general condition, I can see no objection to performing the preliminary and the major operation at the same sitting; and it has its advantages. The patient is saved an extra operation as well as the discomfort of wearing a tube for several days. He avoids also the dangers which are incidental to tracheotomy itself, and some operators claim that in pharynx cases there is great danger of the tracheotomy wound becoming septic in the interval preceding the major operation. As to how long the tube should remain, it depends on the site and extent of the operation. In tongue and jaw cases the tube can be often safely removed in three to four days. In pharynx cases, in a week to ten days, or even after a longer period, when there has been extensive removal of tissue. A good, general rule, I think, is to leave the tube in until the wounds are covered with healthy granulations. Where the tampon cannula has been employed, it is perhaps better to replace it immediately after operation by the ordinary tube. Some, however, leave it in for a day or two and then use the ordinary tube. The latter procedure is, I think, objectionable, as with Trendelenburg's cannula the bag is extremely liable to rupture, and in the case of the Hahn or Kocher cannula the sponges rapidly become septic. My individual experience with the preliminary operation is very limited, as I have performed it but six times; in one case twice, and in each case the major operation has immediately followed.

The following are the brief histories of the cases, and they may be of interest:

CASE I.—*Sarcoma of the Tonsil.*—J. F., female; married; thirty-six years of age; admitted to St. Luke's Hospital February 2, 1894. Six months ago enlargement of right tonsil was noticed, and two months later the growth was removed through mouth. Pathologists pronounced it an endothelioma. Six weeks later there was recurrence, which was again removed through the mouth. Recurrence again in a month, and attempts were made to destroy the growth by the use of the actual cautery. Family and personal history negative. On admission patient's general condition good, aside from slight anæmia due to her being three months pregnant. Examination reveals a hard mass involving the right tonsil, the anterior and posterior pillars of the fauces, and a small area of the wall of the pharynx. Submaxillary gland enlarged, also a few anterior cervical glands. Surface of the tumor was somewhat ulcerated, and bled easily upon manipulation. Patient complained of difficult deglutition and pain in right ear.

On February 3, under ether, preliminary tracheotomy, tamponnade of the pharynx. A curved incision from below the lobe of the ear to the great cornu of the hyoid bone. Several enlarged lymphatic glands removed, anterior to the sterno-mastoid muscle. External carotid artery exposed and ligated, also the lingual, facial, and ascending pharyngeal arteries. Posterior belly of digastric muscle, stylo-hyoid muscle, stylo-pharyngeus, and stylo-glossus muscles cut through. Incision beginning at the junction of the middle and lower thirds of the original incision, carried upward and forward over the jaw, and ending just anterior to the insertion of the masseter muscle. Submaxillary gland and several small lymphatic glands removed, lower jaw sawn through just behind last molar tooth, and oral cavity opened. Ramus of jaw loosened up on the inside and then elevated, and with a retractor the sterno-mastoid muscle together with the carotid vessels drawn backward, thus fully exposing the seat of operation. With the scissors the tonsil, anterior and posterior pillars, and a portion of the wall of the pharynx easily removed; hemorrhage slight. Wound in pharynx partly closed by a few silk sutures, also upper part of the wound in neck. Pharynx packed with sterile gauze, wound with iodoform gauze. Patient recovered well from the operation, and dressing changed a few hours after operation. The first forty-eight hours after operation nourishment by enemata, and afterwards by stomach-tube. Dressings changed every four hours for the first three days after operation, after that twice a day. Tube out on the seventh day; solid food allowed on the eleventh day. March 1, wound entirely healed; patient discharged March 2. Microscopic examination of tumor showed it to be a small, round, and spindle-cell sarcoma. Two months afterwards recurrence appeared in deep cervical glands near the root of neck. Operation offered and refused. Erysipelas toxines were faithfully used without the slightest benefit. Death six months after operation.

CASE II.—*Sarcoma involving Tongue and the Floor of the Mouth.*—W. F., aged fifty-six years; female; admitted to St. Luke's Hospital April, 1894. Five years ago a small cyst was removed from the floor of the right side of the mouth. Five months ago small growth was removed from the floor of the mouth at the site of the former cyst. Under the microscope, was pronounced to be endothelioma. Disease recurred in two months and rapidly spread over the floor of the mouth and to the tongue. When examined on admission the tumor involved entire floor of the right side of the mouth, a large part of the right half of the tongue, and extending slightly over into the left half, and also downward to the submaxillary gland. Operation April 28, 1894. Ether, preliminary tracheotomy, removal of the entire tongue and floor of the mouth through Kocher's incision. Right lingual artery tied in wound, left lingual through incision in left side of neck. Pharynx packed with sterile gauze, wound with iodoform gauze. Nourishment by enema for first forty-eight hours, then through stomach-tube. Tracheotomy-tube removed on fourth day. Recovery uneventful, patient discharged June 1.

On March 26, 1896, owing to slight recurrence in the floor of the mouth and posterior portion of the scar, under ether, preliminary tracheotomy was performed and the entire scar and recurrence in mouth thoroughly removed through Kocher's incision. Recovery uneventful; tracheotomy-tube removed on third day; wound healed in three weeks. At the present time patient's condition is very good, but there is a suspicious hard and painful spot in the posterior end of the scar which I shall shortly remove. The result is an excellent one as regards prolongation of life.

CASE III.—*Epithelioma engrafted on Syphilitic Gumma of the Tongue.*—A. G., male; aged thirty-six years; admitted to New York Hospital July 5, 1895. Patient contracted syphilis ten years ago. Six months ago scratched the right side of his tongue on the edge of a sharp tooth. The wound never healed, and growth in the tongue soon appeared. Patient's general condition fair. In examining the mouth there was to be seen a hard mass involving the greater part of the right half of the tongue, and also the left half slightly. Enlargement of the sublingual and submaxillary glands. The greater part of this mass was covered by an ulcerated surface, the edges of which were slightly elevated and indurated. Small piece removed and submitted to pathologists, who pronounced it epithelioma engrafted upon syphilitic gumma. On July 12, under ether, preliminary tracheotomy, removal of entire tongue through Kocher's incision. Patient stood the operation very well, and left the table in excellent condition. That evening, some six hours after operation, patient suddenly coughed, and expelled the tracheotomy-tube. The nurse in attendance attempted to get it back without success. The house-surgeon, who had been sent for in the mean time, quickly responded, and attempted to insert the tube into the trachea, but did not succeed, and the patient succumbed to asphyxia. The ending of this case was most unfortunate, and might have been avoided had I, at the time of operation, inserted a loop of silk into each edge of the wound in the trachea, and left the ends hanging over the neck. At the time of the expulsion of the tube the nurse, by drawing on the ends of these silk loops, could have kept the wound in the trachea open and thus prevented death by suffocation. In view of the ending of this case I have always made use of these silk loops in subsequent tracheotomies.

Case IV.—*Sarcoma of the Larynx.*—A. C., aged forty-five years; male; presented himself in May, 1895, at the New York Eye and Ear Infirmary, complaining of dyspnœa and hoarseness. A growth in the larynx, apparently starting posteriorly above the vocal cords, was seen. Portion of the tumor removed by forceps, but the growth rapidly recurred. In August dyspnœa became very severe, and by means of laryngeal forceps a pedunculated growth was removed, thus affording great relief. A microscopic examination showed it to be small, round-cell sarcoma. Recurrence rapidly set in, and in September the dyspnœa and hoarseness were more marked than ever. On September 8, chloroform anæsthesia, preliminary tracheotomy, laryngo-fissure. Growth together with all the soft parts of the right half of the larynx removed, down to the thyroid cartilage. Base of growth cauterized. Thyroid cartilage united by two silver sutures; skin wound with silk. Tracheotomy-tube removed second day; recovery uneventful; patient discharged ninth day; wound healed.

In February, 1896, patient appeared suffering from great dyspnœa and hoarseness. Examination revealed extensive recurrence. Sent to the hospital for tracheotomy, but, owing to improvement in the breathing shortly after his entrance to the hospital, he refused operation and left. In March he appeared again with excessive dyspnœa, and I sent him into St. Luke's Hospital and performed tracheotomy under cocaine anæsthesia. Patient improved during the next few days, and asked permission to leave hospital, promising to return in ten days and have complete laryngectomy performed. Never turned up again. But I have ascertained that a few weeks later Dr. Gerster successfully removed the entire larynx, but the patient died a few weeks afterwards.

Case V.—*Cancer of the Tongue.*—F. A.; male; aged seventy-three years; admitted to St. Luke's Hospital February 14, 1896. Four months ago a small, warty growth appeared on the right side of the tongue about its centre. This was cauterized, and rapidly grew in consequence, so that at the time of admission the growth was as large as a silver quarter. Enlargement of the right sublingual and submaxillary glands. Patient's general condition apparently excellent.

February 17. Ether narcosis; preliminary tracheotomy; right half of tongue, right side floor of mouth, removed through Kocher's incision. Operation quickly performed; hæmorrhage slight. Patient left the table in excellent condition. Did well for eighteen hours, then temperature became elevated, pulse accelerated, and large amounts of bloody purulent mucus were expelled through the tracheotomy-tube. Patient succumbed to septic pneumonia forty hours after operation.

It is but fair to state in this case that the patient demanded operation, although the dangers were explained to him, and he was, in addition, told that on account of his advanced age the chances of recovery were against him. Perhaps it might have been better had I employed Whitehead's method, but, owing to the enlargement of the sublingual and submaxillary glands, I thought it more advisable to perform a radical operation. Tracheotomy was rather difficult, as, owing to a very short neck, the distance between the cricoid cartilage and the sternum was barely over an inch, and about half this distance was occupied by the enlarged isthmus of the thyroid gland. It was necessary to cut through the isthmus in order to gain access to the trachea.

DIRECT INTRA-ABDOMINAL FINGER-COMPRESSION OF THE COMMON ILIAC ARTERY DURING AMPUTATION AT THE HIP-JOINT.[1]

By CHARLES McBURNEY, M.D.,

OF NEW YORK,

SURGEON TO ROOSEVELT HOSPITAL.

LOSS of blood during the performance of amputation at the hip-joint is of especial importance because almost all of the cases in whom this operation is indicated belong to one of two classes: (1) Those suffering from extensive, often long-continued, disease, and who are therefore feeble and anæmic. (2) Traumatic cases, weakened by the shock of the traumatism, and usually anæmic from considerable blood-loss. Therefore in amputation at the hip-joint every precaution should be taken against hæmorrhage and against sepsis.

In the last three cases which I have had I have adopted a method which is simple and effectual, and all three patients have recovered.

First, as much blood as could be safely returned to the body from the limb to be amputated, by means of position or elastic bandage, was so returned. Then an incision was made through the abdominal wall about one and a half inches internal to the anterior spine of the ilium.

In the last two cases this incision was made by separating the aponeurotic and muscular fibres according to the plan suggested by me in operating for removal of the appendix in the interval between attacks. This, of course, eliminates the possibility of subsequent hernia. Through this incision one of my assistants passed his index-finger and readily reached and compressed the common iliac artery.

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[1] Read before the New York Surgical Society, February 24, 1897.

Entire absence of blood-current beyond the point of compression was readily maintained throughout the amputation which followed. The operative field was entirely free from bandage or appliance of any kind, the opportunity to maintain complete asepsis was therefore free from complication, and the amputation was made without other loss of blood than that which took place from the vessels of the limb below the point of amputation. I think that the method commends itself on account of its simplicity, its certainty, its aseptic character, and because it can be applied to cases which require that the deeper tissues should be severed at an unusually high level.

Modern experience has shown conclusively that a clean finger can be introduced into the peritoneal cavity and kept there for a long time without incurring the slightest risk of causing intraperitoneal sepsis.

The first of my three cases was presented to the New York Surgical Society in April, 1894. It was that of a very emaciated, anæmic boy, fourteen years of age, who had a large, giant-celled sarcoma of the upper part of the right femur. The tumor extended upward so far that the vessels in front had to be divided just beneath Poupart's ligament, otherwise an imperfect amputation would have been done. In this case the abdominal incision was made just outside of the edge of the rectus muscle. No blood was lost, but on account of the anæmic condition of the patient 1500 cubic centimetres of hot sterile salt solution were injected into the median basilic vein of the arm, while the amputation was being done. This patient made a prompt recovery.

It was noticeable in this case as in others that the method of controlling the artery has the advantage that *all* the smaller arteries in the stump can be readily identified and ligated. It is only necessary to lift the finger for a fraction of a second, and so allow a minute quantity of blood to escape. This insures the application of a ligature to every small vessel, some of which might otherwise escape detection and subsequently bleed under the dressing. I am able now to report two additional cases, which are as follows:

CASE II.—Charles C., twenty years of age, came under my care at the Roosevelt Hospital on October 27, 1896. He had then suffered for five years from extensive tubercular disease of the upper part of the right femur, the soft tissues being riddled with numerous large sinuses. A careful examination under anæsthetic, aided by the knife, demonstrated the impossibility of obtaining a cure by conservative operation. The patient was anxious to get rid of the limb, and his emaciated and feeble condition called for radical treatment by amputation.

The operation was done in the manner described above on November 7, 1896. An Esmarch bandage was applied from the toes up to the line of diseased tissue, so that all available blood might be returned to the body.

Entrance to the abdominal cavity was made by separating the muscular and tendinous fibres, and one of my assistants easily compressed the common iliac with his forefinger. The amputation was then made with no blood-loss, excepting such as took place from the tissues below the line of incision.

After the operation 1000 cubic centimetres of hot sterile salt solution were infused in the left median cephalic vein.

On November 9 the mouth temperature was 99° F., and the pulse 115. The patient's recovery has been rapid and without incident, and he has entirely regained his flesh and strength.

CASE III.—Henry S., eleven years of age, was run over by a cable-car on November 27, 1896. The right femur was fractured at the middle, and the soft parts very extensively crushed and lacerated throughout a wide area. Much blood was lost and shock was highly developed. The boy's condition entirely contraindicated complete operation, so a little chloroform was given, the limb cut away at point of injury, the femoral artery ligated, and the stump rapidly disinfected and dressed with sterile gauze and cotton; 1000 cubic centimetres of hot sterile salt solution were infused in the median cephalic vein of the left arm.

By the 5th of December the patient's condition had improved to such an extent that I felt safe in doing a complete operation.

Amputation was done at the hip-joint according to the method already described. Control of the common iliac artery was very easily maintained throughout, and no blood was lost. After operation 1000 cubic centimetres of salt solution were infused in the right arm. For a few days a rapid pulse gave me some anxiety, but this symptom soon subsided and recovery has been rapid and complete.

UPON THE DEPORTMENT OF NEEDLES PENETRATING THE TISSUES.[1]

By OSCAR H. ALLIS, M.D.,

OF PHILADELPHIA,

SURGEON TO THE PRESBYTERIAN HOSPITAL.

A FEW evenings ago I was visited by a middle-aged colored woman, who stated that she had thrust a needle into her shoulder by suddenly throwing herself against a part of a sofa. She had immediately summoned a physician who attempted to remove it, and failing had referred the case to me. She stated that after she drove the needle into her flesh she could feel the end on the surface of the skin, and that the doctor in trying to get it out had driven it farther in. This last statement arrested my attention. I felt that it contained a truth and an untruth. A truth that she felt the broken end of the needle upon the surface before the doctor attempted to remove it, and an error in charging its suddenly burying itself beneath the tissues to the doctor's attempt at its removal. The position of the needle—the right deltoid region—made it an easy matter for the sufferer to open her dress and convey her hand to the point of injury without moving her injured arm, but when the doctor came and began his manipulations, the mere elevation of the arm to remove it from the sleeve would—if the needle possessed sufficient length—cause the part that penetrated the deeper tissues to draw the surface end through the skin. Such, at least, is a plausible explanation. I found the needle upon examination clearly defined beneath the skin and even pushing it upward after the manner of a tent-pole.

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[1] Read before the Surgical Section of the College of Physicians of Philadelphia, February 12, 1897.

If this is the correct rendering of the first step, may it not also be regarded as the key to the correct theory of the wanderings of needles in the human body. The broken needle now lay with its blunt end squarely against the firm skin, its sharp end pointed into the deeper tissues. The needle now has one of three destinies before it,—viz., it must remain indefinitely *in situ;* it must back outward, or proceed inward. To favor the latter we have the dense tough skin making a constant pressure against a blunt surface. By degrees the needle is forced through the superficial fascia when upon penetrating the deep fascia it encounters a second impelling force similar in many respects to the first. That needles make the transit of the tissues and organs of the body is a clinical fact, and until this case presented itself it was not clear to me how it was possible.

The part of the needle likely to break is a mechanical problem. A mechanic can break a piece of steel held in the jaws of a vise at any point he may desire. From such data one would naturally infer that density in the tissues pierced would exert a decided influence. If a needle were thrust into the heel and then subjected to a lateral force the point of breakage would be near the surface, but if in the outer part of the thigh, where it would pierce the dense fascia lata, the point of fracture would probably be on a level with it and out of reach of detection by means of the sense of touch in the fingers.

The removal of needles is often a difficult matter, and the reason for this is the aversion to making an adequate incision.

Should the penetration take place upon the face or neck, where a scar would be unsightly, such aversion would be commendable, but when the scar is a matter of no moment, as when the needle has been driven into the heel, then the extent of incision is of little consequence. Many surgeons make a straight incision including the point of entrance midway its length. Having made the cut, the point of the finger is inserted as a searcher for the foreign substance. In the regions of the body, where the skin is soft and pliable, a linear incision answers every purpose, but in the heel, where the derm and epiderm are thick, the surgeon will find great difficulty from such an incision.

In such cases I have found great satisfaction from a semicircular or semielliptical incision, with the suspected point of entrance of the needle lying in the middle of the flap that I intend to raise. From experience I have learned that a large flap is a great advantage and with it I raise the subcutaneous fat, and then when I use my finger as a searcher I am sure that it has every advantage.

Should a threaded needle enter blunt-end foremost, as sometimes happens, and break off below the surface, it is worse than useless to attempt to extract it by drawing on the thread, since it is hardly probable that the broken end of the needle can be made to retrace its steps from such an agency. Besides, with the thread as a guide the locality of the needle can be readily ascertained.

That patients sometimes imagine that they have been pierced with a needle and present themselves for its extraction when no such foreign body is present can be explained, I think, on the assumption that the needle after penetration is drawn out again.

My colleague, the late Dr. Thomas B. Reed, sent for me to assist him in removing a needle that his servant claimed to have stepped on. The doctor had cut down upon the suspected spot, but failed to find the needle. Knowing how painful a thorough search would be I suggested sending her to the Presbyterian Hospital. On her arriving there an anæsthetic was administered and a large oval flap elevated. No needle was found, and on the girl's return to duty she found in the carpet what two hospital surgeons had failed to find in her heel.

CONTRIBUTION TO THE SURGERY OF THE CAROTID ARTERIES.

By JOHN E. SUMMERS, Jr., M.D.,

OF OMAHA, NEB.,

PROFESSOR OF SURGERY IN THE OMAHA MEDICAL COLLEGE; SURGEON TO THE CLARKSON MEMORIAL AND TO THE DOUGLAS COUNTY HOSPITALS.

CASE I.—*Simultaneous Ligation of the Left External and Internal Carotid Arteries; Death on the Third Day from Acute Cerebral Softening.*—Mr. W., aged fifty-six years, was brought to me from Pierce, Neb., by his brother, a physician, on account of an enormous congenital mole situated just in front of the lower third of the left ear. This mole had given no trouble until about six months prior to my seeing the case, when it began to show symptoms of irritation and inflammation, especially on its surface, upon which from time to time a crust or scab formed. It had begun also to change somewhat from red to a slightly mottled black color. It had likewise increased perceptibly in size. For the six or eight weeks prior to my seeing the case the patient had himself observed enlarged swellings in the lower parotid region and for some distance below. General health was unimpaired, although considerable pain and discomfort was felt in the neck. A diagnosis of congenital mole undergoing melanotic carcinomatous degeneration with secondary lymphatic involvement was made. As the usual physical and chemical examinations demonstrated the man to be in good general condition, operation was advised. It was not urged, however, because of my knowledge of the frequent futility of such procedure in this particular form of malignant growth where the glands have become involved, experience having taught that it was usually impossible so to operate as to prevent a comparatively early recurrence.

On the morning of October 14 I excised the primary growth, and also removed the infected glands. The latter procedure was formidable and difficult. In dissecting some of the glands from off the internal jugular vein a small opening was made in that vessel, which was closed by a lateral ligature. Both the left external and internal carotid arteries were ligated. The remainder of the operation was simple and completed in the usual manner, with the patient in excellent condition so far as temperature, pulse, and respiration were concerned. The patient, when returned to bed, was quiet, with the exception of some twitching of the left arm and shoulder.

At 7.30 P.M. on the evening of the day of operation the temperature was 99.8° F., pulse 88, respiration 20; the twitching had diminished. He had been so restless during the afternoon that a quarter grain of morphine had to be given hypodermically. At this time it was observed that there was paraplegia on the right side; both pupils were evenly and finely contracted. On October 15 there was an increasing frequency of the pulse, commencing at 80, and at midnight being 120. The highest temperature reached had been 100.8° F., respiration 26. The patient was unable to speak, but evidently in a half-bewildered way understood what was said to him, and made vain efforts to protrude the tongue when requested to do so. The kidneys had acted freely on the 14th, the bladder being relieved by the catheter, but on the 15th urination had been involuntary. There was free perspiration and considerable accumulation of mucus in the throat. Upon the 16th, the pulse ranged from 98 to 140, respiration from 22 to 60, temperature from 99.6° to 103.8° F. The kidneys had acted freely, likewise the bowels, after the administration of ten grains of calomel, with an equal quantity of bicarbonate of soda; morphine was given hypodermically to control restlessness. A considerable quantity of milk, likewise some coffee, had been swallowed.

On the early morning of the 17th, typical Cheyne-Stokes respiration developed. The pupil of the left eye, before evenly contracted with that of the right, now became widely dilated. Swallowing was difficult. The temperature gradually arose to 105° F., the pulse was 150, respiration variable but rapid; swallowing became extremely difficult. An attempt was made to bleed at the elbow, a vein being opened after the usual manner. The blood was so dark and thick, and flowed so slowly, however, that the radial artery was divided in order to abstract any appreciable amount of blood. All of the unfavorable symptoms increased rapidly, until at noon the man died.

The most recent statistics covering any considerable number of cases of ligation of the common carotid artery (the same in effect as simultaneous ligation of the internal and external carotid arteries on the same side) are found in Wyeth's Tables, comprising 789 cases of ligation for all causes, of which 323, or 41 per cent., died. The principal causes of death were hæmorrhage, exhaustion, and cerebral disturbance, or interference with the functions of the brain from the want of blood and other causes. Paralysis followed ligation of the artery in 52 out of 789 cases. Most of these 789 cases were operated upon before the principles of modern aseptic surgery were understood, and the death-rate was much higher than it would be to-day. However, this criticism does not apply to those cases which were followed immediately or more remotely by cerebral symptoms due to the shutting off of the blood-supply.

Cerebral symptoms, according to Mr. Erichsen, are liable to occur in 25 per cent. of ligations of the common carotid artery. The symptoms of these cerebral complications may come on at once or some days after the operation. Mr. Erichsen divides them into two sets: (1) The early ones resulting from the too small supply of arterial blood,—viz., syncope, twitchings, giddiness, impaired sight, and hemiplegia; (2) after the above have been present for a few days and softening has taken place, convulsions and death ensue. According to Barwell, a large majority of the cases in which so-called cerebral symptoms supervened from the seventh to the tenth day were cases of pyæmia, and in some cases detachment of minute portions of clot may have been the cause. A post-mortem examination upon my patient made almost immediately after death demonstrated acute softening of the brain over almost the whole area supplied by the middle meningeal artery. There was a well-marked leptomeningitis with an excessive amount of cerebro-spinal fluid, some of which was removed for bacteriological investigation. The report shows, specific gravity, 1016½; culture on bouillon, thick, gray scum on top of fluid, clear in centre, gray sediment at bottom. Gelatin liquefied, grayish sediment formed at bottom. Agar-agar thick, moist, diffuse surface layer.

Microscopical examination showed presence of large numbers of oval-shaped spores with rod-shaped bacilli in centre, also free bacilli, rod-shaped ends slightly rounded, about twice the length and three times broader than tubercle bacilli, strongly resembling bacillus filiformis or vermicularis.

These bacilli proved negative to carbol-fuchsin and methyl-blue, also to Gram's methods of staining, but stained freely with "Löffler's" methyl-blue.

The unfortunate result of this case was very unexpected to me, as I had tied the common carotid artery for different reasons a number of times, the patient showing no cerebral disturbances whatever, and I must confess that at the time I applied the ligatures the possibility of such an occurrence was not considered.

It appears from the recorded operative experience of a few surgeons that partially-divided arteries may be repaired by suture without interfering materially with the blood-carrying power of the vessel, and the recent strong advocacy by Murphy[1] of this practice should lead those accustomed to doing considerable surgical work to attempt suture of partially-divided blood-vessels instead of the use of the ligature in those cases where the latter may be followed by dangerous or perhaps fatal complications, and the more recent successful resection, approximation, and suture of the divided ends of the femoral artery with restoration of the blood-carrying function of the vessel ought to be a stimulus to surgeons to emulate this brilliant achievement.

CASE II.—*Simultaneous Ligation of both External Carotid Arteries, with Subsequent Ligation of the Left Common Carotid Artery and the Terminal Branches of the Ophthalmic Arteries for Plexiform Angioma of the Scalp; Cure.*—E. L., aged forty-five years, a resident of South Dakota, was admitted into the Clarkson Hospital July 7, 1893, suffering with a plexiform angioma, or so-called cirsoid aneurism. The growth occupied the forehead, the greater part being upon the left side, and appeared to consist of arteries and veins in about equal proportion.

On July 9, 1893, I performed the following operation: After subcutaneous ligation with chromic catgut of most of the vessels entering the periphery of the tumor, a large horseshoe incision was made, the base upward, the convexity of the flap reaching well to the eyebrow, and the growth was excised. It was noticed that there was considerable absorption of the skull beneath the growth, and that there was free communication between the veins of the growth and those entering the skull. The operation was a bloody one, requiring the use of many ligatures and considerable pressure in order to control the hæmorrhage. Several other blood-vessels which had been overlooked at the time of the operation were ligated subcutaneously a few days later. Union was *per primam* and the patient returned home on July 20. The operation had apparently been a success, and I was hopeful that recurrence would not take place. Five or six months later I received a letter to the effect that the growth was returning, and that disagreeable symptoms, such as throbbing and headache, were becoming annoying, but it was not until February 22, 1895, that the patient again presented himself. This time it was observed that the growth had returned, so that it was larger than when the patient had first been seen, and the annoyance that it occasioned was almost unbearable, and therefore, on February 25, 1895, I ligated both the external carotids simultaneously, the ligatures being placed below the origin of the lingual arteries. This operation checked all pulsation, but in order to favor the permanency of success I ligated, March 13, 1895, the left common carotid artery below the omo-hyoid muscle. The patient recovered promptly from both these operations. There were no cerebral disturbances; union was *per primam*, and the patient returned home March 28, 1895. I heard nothing of him until shortly before January 20, 1896, when the patient again presented himself. At this time a considerable enlargement and pulsation of the terminal branches of the ophthalmic artery just without the orbit was observable. These vessels were ligated on January 21, 1896, and the patient discharged February 4, 1896, and has remained well and free from recurrence to date.

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[1] Meeting of the American Medical Association, Atlanta, 1896.

Plexiform angiomata are rare, and, according to Sutton and Senn, consist of a number of abnormal tortuous blood-vessels of moderate size arranged parallel to one another. They are true angiomatous tumors and not aneurisms, but are often called "aneurisms by anastomosis" or "cirsoid aneurisms," but this is a mistake. These tumors are found most commonly in young adults, and almost invariably show a tendency to grow. Senn says,—

"The surgical treatment of plexiform angioma has so far not yielded very encouraging results. Ligature of the principal artery of the part occupied by the tumor has not proved satisfactory. Ligature of the arteries supplying the tumor has not yielded much better results. In tumors of moderate size and readily accessible on all sides excision offers the best prospects. If the tumor is large, it is well to tie several of the larger vessels prior to the excision. If it is important to make the incision some distance away from the growth in the excision of an ordinary nævus, this advice applies with still greater force to the excision of a plexiform angioma. The principal vessels which nourish the tumor should be exposed and be secured with hæmostatic forceps before they are cut. Pressure is an important factor in securing provisional hæmostasis in the excision of a plexiform angioma. In such cases the skin over the tumor should be reflected and preserved if it is intact. If the angioma involves the skin, this must be excised with the tumor, and the resulting wound-surface is paved at once with Thiersch's grafts."

In a case reported by P. Bruns, both external carotids and the left common carotid arteries were tied as in my case, but death followed on the third day from embolism and thrombosis of the left middle cerebral artery.

TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, February 10, 1897.

The President, Frank Hartley, M.D., in the Chair.

LIPOMA ARBORESCENS OF EXTENSOR TENDON SHEATHS OF FOREARM.

Dr. Willy Meyer presented a woman, forty-eight years of age, upon whom he had operated in 1892, removing the tendon sheaths of the extensor tendons of both forearms, for what at the time was supposed to be tuberculous degeneration, but which proved to be lipomatous masses. At the time of the operation, five years ago, the swellings along the tendons on the left arm had been growing for fourteen years, on the right one for eleven years; function was markedly interfered with, flexion of the second and third fingers on both hands was impossible. There were a number of swollen lymphatic glands in front of the sterno-mastoid, and evidences of former breaking down of tuberculous glands. There were also evidences of arthritis sicca. The operation was done under Esmarch bandage and aseptic precautions, no antiseptics whatever having been used. The tendon sheaths were excised with the growth. The fascia and skin were united over the tendons. The wounds healed kindly under one dressing; after a time the functions of the hands and of the fingers returned, so that in 1894 she was quite able to perform her work. Now she could bend and fully straighten the fingers. There was slight impairment of motion in the wrist, due to uric acid deposits. The case showed that the operation was as appropriate for lipomatous degeneration as for tuberculous.

With reference to the starting-point of the disease, it would seem the meso-tendon was at fault, and that we can cut it away without endangering the life of the tendon, which we could not do in like conditions of the meso-intestine without endangering the life of the latter.

THYROIDECTOMY FOR GOITRE.

Dr. W. B. Coley presented a woman, aged sixty-three years, from whom he had removed a large goitre by operation thirty years ago. She first noticed an enlargement in the region of the thyroid. This slowly increased, involving both lobes of the gland, until it reached a large size. In the fall of 1896 she was treated at the New York Hospital with thyroid tablets, with slight decrease in size, but with marked increase in nervous symptoms. Operation was advised by Drs. Weir and Bull, but the patient refused operation. When first seen by Dr. Coley her pulse was 120, and the size of the tumor interfered considerably with respiration. Operation was again advised, and this time she consented to undergo it. The operation was performed at the New York Cancer Hospital in November, 1896.

The operation was rather a formidable one, but by careful enucleation and tying the vessels before cutting very little blood was lost. The tumor masses nearly surrounded the trachea.

The time of operation was about forty-five minutes. There was considerable shock following the operation, but she rallied under rectal saline injections, and strychnine hypodermically. She made an uneventful recovery.

She remained well until ten days ago, February 10, when she suddenly noticed drooping of the right eyelid, and loss of power in the muscles of the right side of the face.

This condition has remained up to the present time.

TRAUMATIC PARALYSIS OF MUSCULO-SPIRAL NERVE.

Dr. Fred. Kammerer presented a man, thirty-six years of age, who, last summer, had been struck on the middle of the humerus by a lift, causing a fracture. When seen by Dr. Kammerer four months later he could readily make out a well-united fracture at the middle of the humerus. There was also complete paralysis of the musculo-spiral nerve. The patient had been sent to the speaker for operation, but after careful examination he had refused to operate, and was much pleased when the patient had presented himself to-day to find that the paralysis had begun to disappear.

It was well known now that these cases are not as rare as they were formerly considered to be. The first question which arose was whether the lesion of the musculo-spiral was primary or secondary. In this instance it was not difficult to decide, for the history showed that there was disability in the extensors immediately after the trauma, so that secondary lesion by inclusion of the nerve in callus could be excluded. The main point of interest was the precise nature of the lesion involving the nerve. Was it a contusion followed by degeneration and then regeneration after the lapse of months, or, perhaps, pressure upon the nerve by a small dislocated fragment of bone, or separation in continuity? Although he decided not to operate, he was not certain but what a slight projection, which he felt at the posterior circumference of the humerus at the seat of the fracture, was a fragment of bone causing the paralysis by pressure. However, the improvement which had taken place during the last two weeks pointed rather to simple contusion of the nerve with consecutive degeneration of the peripheral end, which had led to a loss of function for nearly six months. There were some cases on record in which eight months and a longer time had elapsed before improvement set in, and even these finally ended in complete recovery. What should we do after six months when paralysis still existed? Should we cut down and inspect the nerve—in itself no serious operation—or should we extend the time and see whether improvement would take place without operative interference?

THE IMPORTANCE OF THE PRIMARY DIRECTION OF THE SAC AND SPERMATIC CORD IN OPERATIONS FOR THE RADICAL CURE OF HERNIA.

Dr. George R. Fowler read a paper with the above title.

Dr. W. B. Coley said that it seemed to him that the fact to be proven before one brought out a new operation for hernia was that Bassini's was more or less a failure. Dr. Coley could not admit this to be true. The Bassini operation had been long enough before the profession to demonstrate its success. Indeed, Bassini's own cases were not published until he had been operating four and a half years. Only seven out of the 251 cases had relapsed. Dr. Coley had operated upon 300 cases by the Bassini method with but one death and three relapses. Some of them were operated upon more than five years ago, a considerable number more than four years, and 185 had been traced beyond one year.

A number of years ago he had traced 250 cases of relapse after various operations for hernia, and the cases seen since then at the Hospital for the Ruptured and Crippled had increased the number to over 300. It was found that when relapse did occur it was far more likely to occur within the first six months after operation than at any other time,—65 per cent. the first six months, more than 85 per cent. the first year.

With regard to the Kocher operation, he did not think surgeons were in a position at the present time to say how it compared with Bassini's. It would be necessary to have a large number of cases traced through a considerable period of time before such a comparison could be made, and Kocher himself had not given these statistics. Those which he had first published had not gone a sufficient length of time.

Dr. Coley thought Kocher's method of dealing with the sac was inferior to the method of cutting it off, as Bassini did. If properly dissected up to the point where it merges into the general peritoneum and there ligated, no pouting process remains to invite relapse.

Recently published statistics of results in 173 cases operated upon since 1889 by different methods at the Heidelberg Clinic showed that Bassini's method gave far better results than any other.

As to the suture, although the method of Dr. Fowler was very ingenious, bringing the parts in excellent apposition, he did not believe that any suture withdrawn in so short a time would give as strong union of tendinous structures as there should be in a hernia operation. The kangaroo tendon would remain two or three months if properly chromicised, and even then it was replaced by fibrous tissue which resisted a long time afterwards. In a case recently operated upon by Dr. Bull he had found it present after a year, the tendon having been replaced by fibrous material which looked like the suture. The speaker thought it would be far better to turn our efforts towards aseptic technique and try to avoid suppuration, which Dr. Fowler had given as the reason for occasional failure from the Bassini operation. It was because sepsis was liable to produce conditions which might cause failure in the Bassini operation that we were asked to perform a different operation which we were told would not be so likely to result in failure if sepsis should occur. But sepsis ought not to occur in a hernia operation. Taking his inguinal and femoral cases together, Dr. Coley had operated 350 times and obtained primary union in 96 per cent.

Dr. George Woolsey thought that, judging from his own experience, Dr. Fowler had rather exaggerated one or two conditions connected with hernia operations. One was the weakening of the abdominal walls by the division of the external oblique aponeurosis. The line of the fibres of the external oblique being nearly parallel with the line of the incision, there was little tendency for the edges of the aponeurosis to separate and weaken the abdominal walls in the line of incision,—a fact made use of in McBurney's incision in certain cases of appendicitis.

With regard to the infundibulum or dimple at the inner end of the sac, he thought it was done away with by the Bassini or Halstead operation, or, at least, as he had practised those operations, suturing in the Halstead method as one would in an ordinary laparotomy, and in the Bassini pulling upon the sac before tying it off.

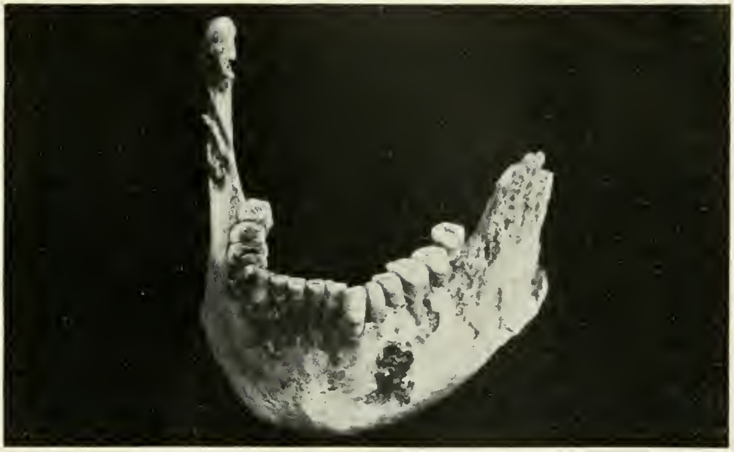
Dr. Woolsey had for some years used the crossed sutures for hernia operations, and had done so for a twofold purpose,—to bring the cicatrix of the skin close to that in the deeper parts and also to keep the cord in place above or internal to the cicatrix, according to the method of Postempski. The only difficulty which he had found was that in fat subjects it had brought the edges in too much; but he thought that difficulty might be entirely overcome by the method shown by Dr. Fowler of tying around a small piece of rubber tubing. He had not passed the sutures deeply, only through the margin of the external oblique aponeurosis and the skin. Thus the cord had been held up to the inner side above the line of incision instead of below, as Dr. Fowler had said was the case in the Halstead operation.

Dr. Fowler rejoined that he did not wish it understood that this method described by him was an attempt to supplant the Bassini operation, for it was practically the Bassini operation with the addition of a method of turning up the sac and looping up the cord. An effort to change the primary direction of the cord was made, of course, in the Bassini operation, and no doubt all had obtained excellent results from that operation when there had been no sepsis.

One advantage of the method of suturing described in the paper was the removal of possible sources of infection, or of one at least. It was less likely to be followed by suppuration than any other. He had practised this method of carry the cord in an upward direction for four or five years. In November, 1892, he had read a paper before this society, describing the suture and its application, and also made the suggestion to pass the cord in an upward direction first. However, at that time he simply secured it in position by a suture of catgut. The present method was but a modification of that one so far as suspension of the cord was concerned. Up to that time he had operated upon thirty-three cases, with no relapse in inguinal hernia. Since then he had operated by the same method in forty-nine cases, and in none of those which he had been able to trace had there been a relapse. Excluding three cases of femoral hernia from among the original thirty-three, there had been thirty cases of inguinal hernia, and forty-nine subsequent cases, or seventy-nine in all. In none of these, so far as was known, had there been a relapse. Some of them had not passed the two-year test. The patients had been specially requested to report should recurrence take place, and had even been offered a reward for doing so, so that it was fair to infer there had not been any recurrences. This was a good showing for the method pursued, that of elevating the cord. This, together with that of directing the sac in an upward direction, did not add to the danger, lessen the rapidity, nor in any way increase the difficulties of the operation.

TOTAL NECROSIS OF LOWER JAW.

Dr. Willy Meyer presented a lower jaw removed from a man who had come under Dr. Meyer's observation in May, 1896. The patient had suffered from an alveolar abscess: he had been unwilling to have the tooth pulled, and as a consequence necrosis had spread over a large part of the entire inferior maxilla. When he entered the hospital there were a number of perforations in the floor of the mouth and externally below the jaw. Under cocaine the pus-pockets were cut open, the pus evacuated, and the necrosed spots were scraped, the periosteum being left with the hope that it would be stimulated to the development of new bone; but after a time the discharge became so foul that it could not be longer borne by the attendants, nor by the patient himself, and it became necessary to remove the lower maxilla. The possibility of the case being one of phosphorus-poisoning had been eliminated. Although the periosteum had not formed a new jaw, the patient could still open the mouth and talk. His chief annoyance was from a fistula leading from the mouth to the outside, which Dr. Meyer had proposed to close



Dr. Meyer's case of complete necrosis of the lower jaw.

by a flap operation, but the patient could not take ether nor chloroform, and was unwilling to have it done under cocaine. He was well able to swallow fluids, and could partially chew mashed potatoes and scraped meat. It was possible an ingenious dentist could give him a plate for the missing lower teeth to rest upon, attached by springs to the teeth of the upper jaw.

Dr. Coley said he was called one evening to see a man who had been treated by a dentist for eight days for a condition which had begun as a slight ulceration of the tooth. On arriving he found the odor intensely foul, the pulse 150, scarcely perceptible, respirations between 40 and 50, temperature 104° F. ; death occurred seven hours later. The entire lower jaw was involved in the necrosis.

Dr. B. F. Curtis said that he had recently seen a case of total necrosis of the upper jaw in a child about five years of age, coming on some weeks after an attack of measles. The cheek was perforated, the condition resembled noma, a slough having formed about the size of a silver quarter, then the right superior maxilla separated entirely from its periosteum. It was removed through the mouth without an external incision, and the child made a good recovery, but with the deformity such as might be left by noma.

RUPTURE OF ANTERIOR TIBIAL ARTERY IN SIMPLE FRACTURE OF TIBIA AND FIBULA.

Dr. George Woolsey presented a specimen, consisting of the leg of a man, aged sixty-three years, who had fallen on the sidewalk, December 15, 1896, sustaining a fracture of tibia and fibula of one leg. He was treated at home for sixteen days, then developed gangrene of the toes and foot and was taken to Bellevue Hospital. There was gangrene of the toes and a dark-bluish discoloration of the front of the ankle, and the dorsum of the foot over the distribution of the anterior tibial artery and the dorsalis pedis, its continuation. The gangrene had extended up to the ankle and perhaps a little above in front. The man refused any operation at first. His heart and physical condition in general were bad. He remained in the hospital eleven days before he consented to have anything done. Meantime the dorsum of the foot became entirely gangrenous, the circulation, which had been very sluggish, disappeared entirely from the affected part. The gangrene had spread upward and seemed limited at four or five inches above the internal malleolus. There had been no great amount of swelling, and the gangrene was not moist. Amputation was performed by the modified Hey's method with a long posterior flap about the middle of the leg.

The specimen showed oblique fracture of the fibula about two inches above the external malleolus, and an oblique comminuted fracture of the tibia an inch or so higher. The tibial artery had been caught between the fragments of the tibia, and the end of the proximal portion of the artery was partly embedded in the scanty callus. There had been but little attempt at union, but the little callus thrown out had embedded the artery.

This was only an occasional, but a serious complication of fracture, and according to the statistics of Gurlt four-fifths of the cases were in fracture of the leg. It occurs in situations where the artery lies close to the bone. In many cases it has caused a traumatic aneurism of some kind. Not so in the present instance, and the probable explanation was that the circulation had ceased at the time of the injury on account of pressure or thrombosis or that it was stopped by pressure between the bony fragments. The artery both above and below was contracted and fibrous, not calcareous.

The subsequent course of the case was unfortunate. The artery where amputation was performed was pervious and spurted fairly well, but the man had a bad heart-action and pulse and soon developed œdema of the lungs. Although he recovered from the pulmonary œdema, gangrene spread up the leg in the distribution of the remaining portion of the anterior tibial. The patient insisted on having as much of the leg saved as was possible, although he had been told that it would be safer to amputate higher. Still he might have been saved had the heart-action been better. He died about three weeks after the operation.

GOLD FOIL IN TREPHINE OPENING IN THE SKULL.

Dr. Woolsey presented a piece of gold foil which he had inserted between the scalp and brain in a trephine opening, February 1, 1896. The patient was a Greek, who, four years before, was struck by a fellow-workman with a heavy club, causing a depressed fracture of the left parietal bone and also fracture of both forearms. The man was unconscious two weeks, and was then operated upon in Western New York, when a button of bone was removed. He regained consciousness after the operation, was discharged after five weeks, cured except for some pain over the injured area. He remained in good health nine months, then began to have epileptiform convulsions, which recurred every three or four weeks. In March, 1895, he was operated upon in Albany, and apparently more bone was removed, but there was no improvement. After admission to Bellevue he had several convulsions, two the night before Dr. Woolsey operated. These commenced in the right hand, and thence extended to all of the extremities and to the face. Dr. Woolsey performed a bone-flap operation January 20, 1896, when he found the scalp over the opening in the skull adherent to the dura beneath, and the latter adherent to the pia. He removed a portion of the enormously thickened dura over a space of two inches in diameter, and replaced the bone-flap. Two days later the patient had a convulsion which lasted two minutes, after which he was dazed for about two hours, and had a slight tingling sensation in the lips and hand of the right side, as well as some impairment of speech. These symptoms continued, and the area of the bone-flap was noticed to be much protruded. As no improvement occurred at the end of ten days, the wound which had healed well was torn open and a large clot found beneath the bone-flap, and for some distance around it on both sides of the dura, making considerable pressure on the brain. The bone of the bone-flap was removed, the blood-clot cleaned away, and a piece of gold foil was inserted between the scalp and the brain. The gold foil was sterilized by heat, but unfortunately it came in paraffined paper, and some of the melted paraffine had adhered to its surface. There were probably some small tears made in separating the paraffine from the paper.

The patient left the hospital and was in perfect health for several months, during which he was employed in a circus, as he was a man of great strength. When he returned he said he had begun to feel increasing numbness in the right angle of the mouth and a little in the fingers of the right hand, and every three or four weeks he had what he called an "attack" at night. After consulting with Dr. Fisher, Dr. Woolsey reopened the wound and found that the gold foil had not prevented adhesion of the scalp to the brain. The gold foil had broken up into particles, and between them newly-formed fibrous tissue had grown in, forming a layer of considerable thickness embedding the gold foil and forming firm adhesions between the scalp and the brain. Dr. Woolsey was unable to say whether this would have been the result had the gold foil been entirely intact. It was the thickest foil kept in stock by a large dental manufacturing establishment. At any rate, he preferred not to use gold foil the second time, although some was at hand, but inserted a celluloid plate, fixing it in grooved edges of the bone. The patient, who always recovered well from operations, was up and playing checkers on the sixth day. There had been no recurrence of the attacks, nor of the sensory or motor symptoms up to the present date, although some abnormality in the right hand was not unlikely to occur, for the hand-centre, as determined by electrical stimulation, showed the results of a severe laceration of its surface from the injury.

Dr. Meyer said that the same difficulty was likely to arise whenever the plate inserted into the gap did not seal it perfectly. He had once put in a thin piece of celluloid, had made a small perforation on either side to permit of escape of secretions from underneath, and when subsequently it became necessary to remove the plate he found very dense tissue beneath the plate joined with newly-formed tissue above it. He then put in a thicker plate, about one-sixteenth of an inch, without perforation, resting on a small step chiselled into the bone. This had been worn a year. It was best to tampon the wound three or four days, and put the plate in only after all oozing had ceased. In that way the newly-formed tissue over the dura would be as thin as possible. Celluloid was preferred.

TRANSACTIONS OF THE SECTION ON GENERAL SURGERY OF THE COLLEGE OF PHYSICIANS OF PHILADELPHIA.

Stated Meeting, January 8, 1897.

John B. Roberts, M.D., in the Chair.

MULTIPLE GOUTY DEPOSITS (SODIUM URATE) TREATED BY EXCISION.

Dr. Alfred C. Wood exhibited a man from whom he had removed a number of gouty deposits. The history was as follows: He began to suffer about eight years ago from what he describes as attacks of inflammatory rheumatism or rheumatic gout in the arms, hands, legs, and feet. On three occasions only was the attack so severe as to confine him to bed. He has not been able to work for a year on account of stiffness and pain. About seven years ago hard nodules began to form on the back of each hand and in front of each knee. These gradually increased in size. One of the growths had been incised, a moderate hæmorrhage being the only result.

When the patient came under observation at the University Hospital, in August, 1896, there were a number of tumors on the dorsal aspect of both hands. One of these on each hand was as large as a goose-egg; the others were smaller and of various sizes. The skin covering the larger growths was somewhat purplish and slightly adherent to the underlying structure; that over the smaller tumors was unchanged in appearance and non-adherent.

The presence of these masses was the source of constant annoyance, as the hands and fingers were somewhat stiff and useless for many of the ordinary demands made upon them. There was no complaint of pain except when pressure was made upon the tumors in attempting to do some kind of work. There was also a lump in front of each patella, which prevented kneeling.

The patient's history was distinctly gouty, and the appearance and distribution of the new formations, taken in conjunction with his nationality (English), led the reporter to believe that the deposits were gouty in origin. It is needless to remark that other forms of tumors (lipomata, fibromata, chondromata, osteomata, sarcomata, carcinomata, and various mixed growths) were considered, but it seemed possible to reasonably exclude each in turn.

The amount of disability caused by the tumors caused him to operate for their removal on August 25, 1896. One of the large masses situated external to the middle of the back of one hand was found to contain the extensor tendon of the index-finger. The tendon was deprived of its sheath and attenuated ; its course was directly through the centre of the growth, but was not adherent to it. This added considerably to the difficulty of the operation. The mass was so firm that an incision in the line of the tendon could not be separated sufficiently to see when the latter structure had been reached ; it was necessary therefore to cut away the tumor piecemeal until the tendon could be released. There were no firm adhesions to any of the surrounding structures. A similar growth on the back of the other hand had included in the same manner the extensor tendons of the ring and little fingers, and was removed, as was the one already described. The difficulties were increased as there were two tendons to be avoided. The other growths on the hands were attached to the tendon sheaths and were easily removed. One mass was situated directly in front of the patella on one side, and was probably the prepatellar bursa transformed into a mass of urate of sodium. The growth on the other side affected the patella tendon of which it seemed to have formed a part. After removing the tumor, the tendon itself was seen to contain here and there deposits similar in character to that of the tissue removed. The wounds healed kindly, and there has been no tendency to a return of the deposits at the date of this report, five months after operation. Some of those that were considered too trifling to demand removal have increased somewhat in size. Now for the first time it is learned that the patient has a deposit in each tendo-Achillis just above the insertion into the os calcis. As these had been stationary for some time and caused no inconvenience, the patient had not before alluded to their presence.

All of these deposits were connected with the extensor tendons. In the hands the sheaths only were involved, excepting that the distal interphalangeal articulation of two or three fingers was affected, but on the dorsal aspect only. Careful examination of the large masses that surrounded the extensor tendons on the back of each hand showed that the tendon sheaths had been largely destroyed. Here and there small glistening areas indicated remnants of the theca.

Dr. T. S. K. Morton recalled a case he had seen at the Orthopædic Hospital that had multiple nodes of the same size as Dr. Wood's patient, in which they were upon the hands and feet, but not on any other portion of the body. Dr. Morton split one of the masses under local anæsthesia and got out a gritty, pultaceous mass, which, under chemical and microscopic test, was reported to be urate of soda. The deposits precisely resembled those presented in Dr. Wood's case. The patient was directed to return for operation, but had not done so. Dr. Morton said that he should have no hesitation in pronouncing the patient reported as having gouty deposits. He called attention to the fact that the growths frequently occur in the tendon sheaths, but in Dr. Wood's patient there was a distinct history that some of the growths did not involve tendon sheaths, but surrounded them. The small chalky deposits present upon his fingers are quite common in the aged well-to-do, particularly English people ; the large ones are certainly rare in America.

Dr. Charles H. Frazier stated, in relation to the case reported by Dr. Wood, that the patient had been referred back to the University Hospital by Dr. S. W. Morton, in order that the hot-air treatment might be given a trial for rheumatism of the knee-joints, there being an apparatus for applying this treatment in the Surgical Dispensary. The patient has had four treatments, two on each leg, and reports himself that he is very much improved, so much so that, after the treatment, he walked some fifty squares, a thing which he has not been able to do for some months past. Dr. Frazier therefore thinks some progress can be reported.

A temperature ranging from 200° to 250° F. was employed. At each treatment the heat is gradually increased, as the patients seem to become in time accustomed to it.

EXCISION OF A MYXOFIBROMA OF THE NECK.

Dr. Charles H. Frazier related the case of a carpenter, twenty-nine years of age, of healthy parents, who presented himself, in September, 1896, at the Surgical Out-Patient Department of the University Hospital. When a lad of six years he had what he calls a tumor, having its origin in the left axillary space. The tumor grew quite rapidly, spreading both in the direction of the sternum and also towards the vertebra, till it attained the dimensions of a fair-sized melon. The size interfered considerably with the usefulness of his left arm, which he carried almost constantly in a sling. A year and a half had elapsed before the growth attained its greatest dimensions, and in the succeeding year and a half it spontaneously disappeared. Nothing of interest occurred thereafter till about four years ago, when a growth developed over the left scapula, never exceeding an orange in its dimensions. This, as the previous one, disappeared spontaneously. He states these growths were painless, hard, and immovable. They came as mysteriously as they disappeared. The connection, if any, they may have with the case that is to follow is by no means clear and calls for further enlightenment.

A year and a half ago he was struck on the left side of the neck by a brick falling from a height. Severe contusion naturally followed, but no further injury was detected, and in a short time he was entirely well. Three months ago he became aware of the existence of a small lump at the base of the neck. He attributed its presence to the nature of his occupation, which at that time consisted in carrying and hanging heavy doors. He continued working, however, the pain, meanwhile increasing in severity daily until two weeks before the operation, when he was forced to give up. The pain was intense; he could not even bear the weight of coat or overcoat on the shoulder. The pain was referred chiefly to the deltoid region and to the areas over the temporal, parietal, or occipital bones.

Examination revealed a growth at the base of the posterior-inferior triangle of the neck, in size about that of an egg; consistency hard; superimposed skin freely movable; the growth itself firmly adherent to the deep-lying structures. The firm consistency of the growth with its marked immobility and seeming close adherence to the surrounding tissues led us to suspect a malignant growth, and one difficult of removal. The strong appeal of the patient for some relief from the intense suffering persuaded Dr. Wood that an operation was not only justifiable but at the time distinctly indicated, since there was no doubt but that some of the pain at least was caused by pressure on the nerve-trunks. It was doubted at the time whether a complete extirpation of the growth was possible on account of its intimate and firm adherence to the surrounding tissues. The operation was performed September 22, 1896.

A portion of the tumor was exposed and an attempt made to eradicate it chiefly by blunt dissection, for wherever the edge of the knife was used there was profuse bleeding, all the tissues surrounding being excessively vascular. Not only was this vascularity extreme, but the veins that were met with in the course of the dissection were greatly enlarged. It is no exaggeration to say that in one case the vein was at least as broad as one's thumb.

After a tedious dissection, embarrassed for the most part by the profuse hæmorrhage (the wound soon being crowded with hæmostatic forceps), all the tumor attainable through this incision was freed. At this point it became evident that the tumor extended beneath the clavicle, and that its origin must be sought in a region distant from where the primary incision was made. The tumor could be palpated below the clavicle, when pressure was made directly from above, occupying the subclavicular fossa. A second incision was then made below and parallel to the clavicle in the space between the sternal and clavicular fibres of the pectoralis major muscle. The portions of the tumor above and below the clavicle now being removed, there remained still a portion beneath which baffled all attempts at removal through either incision. The question then arose as to the advisability of dividing or disarticulating the clavicle to make the complete extirpation of the growth possible. Considering the time that had already elapsed (about one and a quarter hours), the loss of blood, which had been considerable, considering, too, the extra time that would be required to turn aside the clavicle, it was not deemed prudent to further prolong the operation.

Ligatures were applied to the bleeding points and the upper wound packed with gauze to control the oozing. The subsequent history of the case was uneventful. The patient reacted from the shock attending the operation and the wounds healed kindly.

The result of the operation might be considered perfect had not a small portion of the growth been of necessity left behind. So far as securing for the patient relief from pain, the operation may be termed a successful one. The patient was seen about three weeks ago, when he professed to be wholly free from pain.

Dr. Riesman reports that the growth is a myxofibroma.

The difficulty of the operation was increased by a foreshortening of the base of the triangle of the neck due to a congenital anomaly of the clavicle, which was shorter than its fellow on the opposite side, and which was the seat of a subluxation at its acromial end. This foreshortening of the space necessitated an incision shorter than would have been otherwise made.

Again, the tumor was situated at least one and a half inches or more beneath the surface. This was partly accounted for by the fact that the patient was a very muscular subject and partly because the tumor had its origin from a deep-lying structure, probably the first rib.

Compared to the depth of the wound the incision was disproportionately short. This, alone, was a serious handicap to the progress of the operation.

Thirdly, the capillary oozing, as was mentioned above, was annoyingly persistent. So much so that anything but momentary inspection of the wound was out of the question. Thus necessitating almost all the dissection being done by the hand, the knife having to be laid aside.

Hampered, then, by the shortness of the incision, the depth of the wound, and the persistent capillary oozing, enucleation was further rendered difficult by the firm, fibrous bands that bound the tumor in place. So solidly was it attached that it required all the force of one's fingers to sever its attachments.

Dr. Wood said that if he had known in advance of the difficulties to be overcome he would have made a preliminary resection of the clavicle, but by the time the necessity for this procedure became apparent the patient had lost so much blood that it was deemed unsafe to prolong the operation to the extent this would require. At the time of the operation the tumor was thought to be a spindle-cell sarcoma; the age of the patient, the free hæmorrhage, and the character of the growth led to this conclusion, but fortunately the microscope showed the growth to be benign. Dr. Wood was especially interested in the case because the termination was so satisfactory, while at the time of operation an unfavorable prognosis seemed justified, for the reason that he did not properly appreciate the extent of the growth beforehand and therefore did not approach it in the best manner, and that he had been baffled in the attempt of its complete removal. The lower portion of the tumor overlay the axillary vessels so that after its removal the vessels were fully exposed.

A FREQUENT CAUSE OF UNUNITED FRACTURE OF THE HUMERUS.

Dr. John B. Roberts gave as his opinion that non-union is more common in fractures of the shaft of the humerus than in other bones because of the entanglement of the soft tissues between the ends of the fragments. He detailed a case of fracture at the junction of the upper and middle third of the humerus in which it was impossible to reduce the fragments even after exposing the bone by an incision. The stripped-up periosteum and the muscles held such relation to the fragments that the continuity of the bone could not be restored until resection of the ends had been performed.

Dr. Morton said that he recalled the case of a man who was a driver and the subject of interstitial nephritis, who was run over by a mail-wagon and sustained a comminuted fracture of the lower third of the humerus. The patient had extreme pain and spasm, which was ascribed to implication of the musculo-spiral nerve. He was put upon Hamilton's extension apparatus, the spasm was overcome, and his pain was less. He was kept in bed three weeks. The spasm promptly recurred on removing the extension and caused the fragments to overlap. The patient did not wish to go to bed again, so was permitted to go about carrying a five-pound weight attached, as extension, to the part. The pain finally subsided at the end of two months, but there was no union. In spite of the nephritis, at his urgent request, about four months after the accident, Dr. Morton cut down upon the ununited fragments. Upon exposure of the seat of fracture it was found that a small fragment lay across between the two main fragments and that a portion of muscle and the musculo-spiral nerve were also implicated in the mass of callus. No bony union whatever was found. The ends of the chief fragments were freshened and wired. The wound suppurated, which was not surprising in view of his kidney condition. Finally, at the end of three months, consolidation had taken place, the wire sutures were removed, and he has since remained well. The arm is a little shortened, but is an entirely useful member. This is a case in which, if it had occurred since the introduction of the Röntgen rays, we would have cut down at once and probably would have secured a recovery in six weeks instead of extending over several months.

EDITORIAL ARTICLES.

WÖLFLER ON THE SURGERY OF THE STOMACH AND INTESTINES.[1]

We have to consider two phases of the subject: (1) The evolution of gastro-intestinal surgery and its technical advances. (2) The influence of the various operations so far performed as regards the cure or relief of the pathological conditions for which they are undertaken.

Twenty-five years ago, the time of the foundation of the German Surgical Society, no gastro-intestinal surgery, properly speaking, existed. Billroth was then conducting his experimental investigation on resection of the œsophagus, the evolution of the surgery of the mouth and pharynx having previously become established through his own work and that of Langenbeck.

Gastrostomy, although practised in the preceding twenty-five years, had as yet been attended with no operative success on a living human being (the first success dating from Sydney Jones, in 1874). Colotomy was then celebrating its first centennial of existence, but as yet had been confined to the extraperitoneal method. A few isolated cases of recovery after wounds of the stomach and intestines existed, but they involved only the closure of limited wounds, and seldom involved resection of the gut. Up to 1871, resection of intestines for trauma had been performed only six times.

In 1727, Randohr performed the first successful resection of gangrenous intestine with invagination of the gut. In the 150 years following this operation it was scarcely performed more than a dozen times, the universal rule being the formation of an artificial anus. Up to the time of the antiseptic era resection of the intestine for a new growth had only once been successfully performed by Reybard. Under these circumstances it seems allowable to ask, What were the factors that influenced so greatly the evolution of gastro-intestinal surgery in the seventh and eighth decades of the present century? Undoubtedly the elements of the greatest importance in the second half of the century are laparotomy and antisepsis, which placed gastro-intestinal surgery on a sure footing. Another factor in promoting the advance of this branch of surgery may be attributed to the favorable results of operations on the œsophagus and the rectum.

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[1] Professor A. Wölfler, Prague, Verhandlungen der deutschen Gesellschaft für Chirurgie, XXV Congress, 1896.

From the time the feasibility of restoring the newly-united intestine into the free peritoneal cavity was definitely settled, can the progress of the new methods be regarded as assured?

As a result of the latter resection of intestine was fully developed and the development of resection of the pylorus made possible, for without restoration into the abdomen of the sutured pylorus the operation could not very well have been undertaken. What form of disease was it which chiefly influenced further development of resection of the intestine? It is quite clear that it was neither new growths of the intestines nor tuberculosis nor gangrene, for these diseases themselves did not present the conditions desirable for the performance of successful operative procedures. Probably nobody will deny that the efforts made to cure an individual, otherwise healthy, afflicted with an artificial anus, gave the greatest impetus to the development of intestinal surgery.

Although Roux in 1828 had made an unsuccessful effort without any artificial means, and Kinloch, in America, in 1863 had performed an intestinal resection for the same condition, but unsuccessfully, having to resort again to the enterotome, it was Hüter who, for the first time in the new epoch, performed intestinal resection of artificial anus (1876); here again a fatal result ensued. A year later Czerny for the first time in this period successfully resected and sutured the intestine with restoration into the abdominal cavity. At nearly the same time Billroth performed the first gastrorrhaphy with a successful and permanent result, and in 1878 Schede and Dittel were the first to resect the intestine successfully for artificial anus. Neither, however, had returned the intestine after suture. It remained for Billroth successfully to perform a total resection of the intestine for artificial anus and subsequently return the intestine into the belly. The same year Köcher, Czerny, and Nicoladoni successfully resected, sutured, and returned the intestine in gangrenous hernia, and a year later (1879) Kraussold and Martini-Gussenbauer obtained for the first time successful results in resection of the gut for new growth, earlier operations of this character having been performed by Thiersch (1875), Gussenbauer (1877), and Schede (1877). Still a year later (1880) Koeberle successfully resected a large portion of the small intestine for cicatricial stenosis.

In the mean while considerable progress had been made in performing gastrostomy. The operation had been done by Sydney Jones (1874) and Verneuil (1876) with an operative success, and Trendelenburg and Schönborn (1877) obtained their first successful results, and at this time developed the principles of the operation which to-day still stand good. Meanwhile, still in 1878, Torelli and Cavazzani (1879) performed partial resection of the anterior stomach wall with a fortunate result, and Esmarch was the first (in 1880) to resect the edges of a gastric fistula and to return the stomach inside after union by suture. Surgical art therefore, through a fortunate association of ideas of these progressive masters, had prepared the way for the development of the most important step,—resection of the pylorus.

That Péan, in 1879, performed the first, and Rydygier, in 1880, the second resection of the pylorus, and that Billroth, ignorant of the prior operations, performed the first successful resection of the stomach, are facts so intimately associated with the history of surgery that they require no further commentary. The operative method of the great master, Billroth, was so judiciously planned that the technique of resection of the stomach as outlined by him is still preserved unchanged by the most skilful and successful surgeons. These operations led to performing total and partial resections of cicatricial contraction of the pylorus (Rydygier), and, furthermore, influenced Heineke and Mikulicz to perform pyloroplasty. Furthermore, it was learned by experience that the whole of the stomach or the entire large intestine or one-half of the small intestine could be removed without danger to life and with the preservation of nutrition and digestion. The impulses that led to the performance of resection of the pylorus did not remain confined to this. It was necessary to find new means to isolate that portion of the stomach and of the intestine which could not be removed and yet preserve nutrition, and consequently gastro-enterostomy and entero-anastomosis were devised. This latter operation, which had already been twice performed in 1852, but unsuccessfully, by Maisonneuve, was resuscitated in 1881 by Billroth, and successfully performed for the first time by Hacker on two occasions in 1882.

While gastro-enterostomy and entero-anastomosis owed their origin to a purely humanitarian impulse to bring relief during the short term of existence of incurable conditions, they were destined to become of importance and of wide-spread adoption as curative and not purely palliative operations. The physiological conditions are not the same with entero-anastomosis as gastro-enterostomy, in both operations the function of the isolated segment is preserved. It is an absolute necessity in gastro-enterostomy, while the reverse exists in entero-anastomosis, the continued passage of fæces causing disturbances or preventing healing. Hacker in 1888 first advanced the proposition completely to isolate the affected portion; Salzer continued the work with numerous experiments on animals and formulated the indications for the operation, which was first performed successfully in man by Hochenegg. Extraperitoneal isolation of the intestine had already been performed by Czerny in 1877, uniting the colon with the rectum for the relief of artificial anus, subsequently destroying the sigmoid flexure with the cautery, and Eiselsberg performed isolation of the inoperable pyloric cancer.

The technique of resection of the stomach and intestines consists of three acts: the isolation of the affected part, its excision, and the reunion of the divided ends. With regard to the mesentery we have derived valuable information from the researches of Madelung and Rydygier, and likewise from Krönlein, in their experience as to the danger of gangrene consequent on ligature of the large vessels (superior mesenteric artery and the middle colic artery), and the far reaching researches of Madelung resulted in forever discarding the time-honored invagination method. Since these observations the circular suture has been used almost everywhere in the art of surgery. Notwithstanding the improvement of results insufficiency of the suture-line occurred not infrequently with the various methods of reunion, which led to a search for other methods, especially of the mechanical aids, most prominent of which is the "Murphy button." The speedy and satisfactory apposition attending this method is certainly most impressive and would take the place of all the other methods were it not due to two faults: (1) The communication, especially in lateral anastomosis, is necessarily limited by the possible size of the button; and (2) the button being an unabsorbable foreign body can be injurious in several respects. Under such conditions it seems justifiable to give further attention to the method of lateral anastomosis with suture of the divided ends, as devised by Winiwarter many years ago.

Senn first employed this method in ileo-colostomy, and Braun, by emphasizing the importance in this procedure of obtaining harmonious directions of peristalsis, caused it to be generally employed.

It is in place here to raise the important question, What operative results have attended the technical advances in resection of the intestines of late years? Observations have been collected with the assistance of Gussenbauer, Mikulicz, Hahn, Gersuny, Kappeler, and Lauenstein, and the following points are to be considered:

(1) What direct operative results have followed resection of the intestines in general? According to our statistics, the mortality is 39½ per cent. Dividing the total operations into those performed

between 1875 and 1888 and those performed from 1888 to 1895, in the first period, eighty-five resections of the intestines were attended with a mortality of 42 per cent., and in the second period 161 resections with 36 per cent. Consequently the results of the last years show only 6 per cent. of improvement. These figures agree tolerably well with the collective statistics of Arale, Jaffé, Hahn, and Götz, which show, up to 1889, 237 resections with 43 per cent. mortality. Dividing the sum total of resections, according to the different divisions of the intestine as far as this is known,—small intestine, ileo-cæcal region, and the large intestine,—out of 221 resections 84 on the small intestines are attended with a mortality of 30 per cent.; 69 of ileo-cæcal portion with 42 per cent.; and 81 of the large intestine with 49 per cent.; the prospect of an operative success diminishing with the decreasing length of the mesentery.

Another question is, What is the influence of the nature of the disease on the immediate operative result? Mikulicz has already quite rightly insisted that the nature of the condition bears an important relation to the operative result. We have results which in the main agree with previous observations. Seventy-eight resections of the intestine for artificial anus with 78 per cent. of cure. The whole statistical observations up to 1889 give 63 per cent. of cures out of 127 cases, and Götz's statistics on the operative results of artificial anus give $68\frac{2}{10}$ per cent. cures out of seventy-one cases. We have next 73 per cent. cures out of thirty-four cases of tuberculosis of the intestine, then cicatricial contraction with 65 per cent. cures out of twenty cases, and, finally, new growths of the intestine with a percentage of only 46 cures out of 114 cases, the majority being carcinoma. Resection of the gut for new growths has the greatest mortality, 54 per cent., and artificial anus the least, 22 per cent. According to Rydygier, seventeen resections for chronic intussusception gave a mortality of 23 per cent. Concerning the duration of life after intestinal resection, it is not possible to formulate an exact percentage, but this much can certainly be said that it is the experience of all surgeons that the permanent results are constantly improving and that many operators record cases which remain free from recurrence many years.

The case of resection of the sigmoid for carcinoma by Martini-Gussenbauer in 1879 is to-day in perfect health. Mikulicz, a case of carcinoma without recurrence for eight and a half years; Czerny, a sarcoma which is without recurrence for six years; Billroth, a case of carcinoma of large intestine which is still well after six years. Moreover, from the collective statistics there are seven cases of intestinal carcinoma free from recurrences for four years, and fifteen cases without recurrence for one and a half to three and a half years. There are also many successful results as regards resection for tuberculosis of the cæcum, all the more remarkable as the observations date back only eleven years.

With regard to the direct operative result of resection of the pylorus, it has been said that the results are so bad that the operation should be replaced by gastro-enterostomy, but this cannot and will not occur, for it would be very astonishing if one should substitute gastro enterostomy for pylorectomy when dealing with a movable cancer of the pylorus without diffused glandular infection. It is quite right, however, in view of the improvement of operative results to deal with cicatricial contraction by gastro enterostomy. The operative results of resection of the pylorus have been much improved of late years. Mikulicz, Krönlein, and Kocher have lately performed the operation in nine to ten consecutive cases without a mishap. According to Winslow, up to 1885 the mortality was still 73 per cent.; according to Guinard, up to 1890 it had decreased to 58 per cent., and according to Zeller, from 1885 to 1892 it was only $34\frac{3}{10}$ per cent. According to the statistics obtained by the author from fifteen well-known operators, the mortality of all their resections of the pylorus, ninety-two cases, is $56\frac{4}{10}$ per cent.; from 1888 to 1896, in 173 operations, only $31\frac{2}{10}$ per cent. Resection of the pylorus for cicatricial contraction gave a mortality of about 10 per cent. As regards the duration of life, observations of German surgeons show that fourteen cases are living or have lived two to four years after the operation, three living over four years, five living over five years. Furthermore, a case of lymphosarcoma (Czerny) still living after six years, and, finally, two cases of Kocher and Ratimow who are still living and well after eight years; in all twenty-four patients whose existence has been prolonged after operation from two to eight years; were those cases living one to two years to be considered, twenty-five more observations could be added. Such satisfactory results fully justify the further resection of the pylorus of carcinoma.

It would surely not be difficult to double these figures were the results of English, French, Italian, and American surgeons at hand.

The indications for performing gastro-enterostomy have also been extended. Regarding the suture there is no division of opinion, and only as regards the locality. Some, like König, Hahn, and Lauenstein, still cling to the original anterior operation, while others have adopted the posterior operation of von Hacker.

We now come to the direct operative results. According to the author's statistics, forty-five cases of gastro-enterostomy prior to 1888 gave a total mortality of 55.6 per cent. (56.4 in pylorectomy). After 1888 the mortality fell for gastro-enterostomy, 219 operations, to 36 per cent. (in pylorectomy, 31.2 per cent.). These statistics agree closely with the extensive statistical observations collected recently by Zeller and Haberkant, in 298 cases (1881 to 1894), 42.6 per cent. mortality, divided in carcinoma, 48 per cent.; in ulcer, 25 per cent. According to Zeller the mortality sank from 70 per cent. (1881 to 1885) down to 38.7 per cent. (1886 to 1892).

Does gastro-enterostomy for carcinoma produce an appreciable increase in the length of life? While the gain in the latter direction is not so appreciable, the question to consider is not so much how long these cases live, but in what manner they live, and the relief thus afforded in many cases fully justifies the performance of the operation. The author has knowledge of fifteen cases in which life was prolonged more than one year; the longest time was two and a quarter years.

The most conservative procedure in cicatricial stenosis of the pylorus is pyloro- and enteroplasty, attended with a mortality of 26 per cent. out of fifty cases in the author's statistics; 26 per cent. out of fifty-one cases according to Haberkant. There are no adverse reports as to permanence of results, but the operation is unfortunately limited, as suture in healthy tissue alone is permissible. The simpler operations of the gastro-intestinal tract have also been improved. Gastrostomy in a single sitting is now the operation of choice, and control of the fistula is obtained by Hacker's operation of sphincteric action of the rectus muscle and Witzel's and Frank's methods of an obliquely directed opening. The mortality of gastrostomy from 1849–83 was 77.7 per cent.; from 1883–86, 37 per cent. The mortality will undoubtedly be reduced in time to come. Colostomy has been improved by substituting the inguinal for the lumbar operation, by complete division of the gut,[1] or otherwise side-tracking the rectum.

Jejunostomy was first performed by Golding Bird in 1885, and has been so perfected by Maydl, Albert, and von Eiselsberg that nutrition can be preserved for months and years. It is as yet too early to pass judgment on its merits.

Notwithstanding some disappointments, a retrospect of the last two decades is most satisfactory. Forever identified with this period of development is the name of Theodore Billroth, the first to perform gastrorrhaphy for gastric fistula, the first successfully to resect the intestine for fæcal fistula with complete return into the belly, the first to successfully do pylorectomy and to combine pylorectomy with gastro-enterostomy, one of the first to resect the cæcum, and the first in modern times to perform entero-anastomosis.

[Professor Wölfler has very modestly failed to mention that he himself devised and first performed gastro-enterostomy in 1881. By many authorities the view is held that his original operation has never been improved on by any subsequent procedures.—Ed.]

Charles L. Gibson.

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[1] Madelung, Schinzinger, 1881.

INDEX TO SURGICAL PROGRESS.

NECK.

I. Cavernous Angioma of the Neck. By DR. PAUL KACZANOWSKY (Kronstadt). The author reports the case of a child who, when four months old, was first seen by a physician on account of a swelling on the left side of the neck, which had existed at the time of birth, but which had increased rapidly in size during the preceding two weeks. Examination showed the tumor to be composed of two distinct masses; the upper one was rounded and the size of the closed fist, lying on the left side of the neck, above the clavicle and scapula; the other was quite angular, somewhat smaller in size, and extended from the axilla at the lower border of the pectoralis major over the pectoral muscles to the clavicle, at which place a narrow but deep depression separated it from the tumor mass above. Palpation showed that this lower tumor followed closely along the course of the subclavian vessels. The consistence of both tumors was so firm that fluctuation could scarcely be made out. The skin over the upper tumor was in a condition of extreme tension, and the subcutaneous veins were markedly distended. During expiration, and particularly during crying, both tumors were noticeably increased in size. Manual pressure caused no diminution in the size of either mass. Exploratory puncture with an hypodermic syringe showed that the tumor was filled with pure venous blood, and the hæmorrhage caused by the small wound was checked with considerable difficulty.

After two weeks of observation it was plainly seen that the tumor was steadily increasing in size. The danger of spontaneous rupture of the sac was great, but the dangers of a removal by operation of one or both tumor masses were evidently so great that such an attempt did not seem justifiable. Instead of such a proceeding, therefore, the plan of methodical compression of the tumor was adopted, and was accomplished by means of a roller bandage of flannel and padding of cotton. The results were surprisingly good; after two weeks the size had noticeably decreased; after six weeks it had been reduced one-half, and after four months no trace of the tumor remained. When the child was one and one-half years old no trace remained of the lower tumor, and of the upper one only a series of loose folds of skin showed its former location. The child is now six years old, and even these folds have quite disappeared.

Whether the tumor first developed in embryonal tissue below in the axillary region and extended progressively beneath the clavicle, or whether numerous cysts developed simultaneously along the course of the subclavian vein is still a question. A case has been reported by C. Beyer in which the growth arose from the lymphatics; in the present instance it appears more likely that it took its origin from the subclavian vein.—*Deutsche Zeitschrift für Chirurgie*, Band XLIV, Heft 4, 1896.

II. The Value of Skiagraphy in detecting Foreign Bodies in the Œsophagus. By M. PÉAN (Paris). The use of x-rays as a method of diagnosis has already been resorted to in a great variety of conditions, and the result in most cases has been extremely satisfactory. Recently M. Péan presented before the Paris Academy of Medicine a child, four years of age, from whose throat he had removed a foreign body, a coin swallowed ten days before. The first physician who saw the child soon after the accident believed that the coin had reached the stomach because of the ease with which she continued to swallow liquids. More careful examination, after a few days, showed that the piece of money was lodged in the œsophagus at the level with the entrance into the thorax. By means of a skiagraph the exact location of the coin was determined, and Péan performed an external œsophagotomy. The trachea was easily exposed, but the œsophagus was identified and laid bare with great difficulty, notwithstanding the fact that it was distended by the foreign body. Instead of opening the œsophagus, gentle manipulation of the tube was performed, and the coin gradually crowded from below upward till the index-finger of the operator passed through the mouth into the œsophagus was enabled to feel it. The slender alligator-mouth forceps of Mathieu was then passed along the finger as a guide, and the coin seized and extracted.

In closing his report of this case, M. Péan calls attention to several important facts. Young children can easily swallow foreign bodies as large as one-half inch in diameter; such bodies, if too large to pass directly into the stomach, are most apt to be arrested at the most constricted portion of the œsophagus. Owing to the fact that the child continues to swallow liquids without difficulty and does not complain of pain the recognition of the presence of the obstruction may be delayed for some time; indeed, during the discussion of the case, both Broca and Péan reported cases where the true cause of death was never suspected until the autopsy revealed the foreign body in the œsophagus. Skiagraphy not only permits an accurate location of the foreign body to be made in most cases, but determines also the operation of election. After the œsophagus has been exposed, buttons, coins, and similar rounded and smooth bodies may be gradually caused to reascend the œsophagus to such a level that they may be extracted from above, thus avoiding the danger and discomfort attending those operations in which the wall of the tube is divided. —*Bulletin de l'Académie de Médecine*, No. 48, 1896.

H. P. de Forest (Brooklyn).

III. Chronic Inflammation of the Thyroid Gland with Formation of a Tumor of Stony Hardness. By Dr. Riedel (Jena). The thyroid gland, like the pancreas, is occasionally the seat of an inflammatory process forming a tumor of extraordinary density intimately adherent to its surroundings. The large vessels of the neck and the trachea cannot be separated from the tumor, and while it simulates an inoperable new growth, microscopic examination reveals only a round-cell infiltration of the thyroid tissue. Two such cases have occurred to the author necessitating the abandonment of attempts at removal. The first patient remained free from symptoms, dying fifteen months later of nephritis. The second patient also recovered, but died two months later, apparently of pulmonary embolism. No autopsies. In the second case, no improvement followed the administration of thyroid extract tablets.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXV Congress, 1896.

CHARLES L. GIBSON (New York).

ABDOMEN.

I. Operation for Relief of Hour-Glass Stomach due to Cicatrization of Gastric Ulcer. By FRANCIS S. WATSON, M.D. (Boston). The patient, a woman aged thirty-two, for three years had been in almost constant pain, vomiting during nine months almost daily, with the exception of five weeks, when the patient was fed by rectal enemata. Within a year had lost forty pounds in weight, her weight at the time of operation being only eighty-seven. She was very weak and emaciated.

The abdominal wall was retracted and rigid. On the left side of the epigastrium there was an area of tenderness, and an ill-defined induration and swelling.

Operation, September 13, 1895. A V-shaped incision was made in the epigastrium, and the stomach exposed. At a point one-third of the way from its duodenal end was a hard mass of cicatrix, circular in form, involving the larger part of the circumference of the organ and constricting it very narrowly. The constriction did not seem to be of a cancerous nature, but rather to be due to the cicatrization of former ulcers of the stomach.

Anastomosis between the two ends of the stomach was accomplished in the following way: The pyloric portion and the first part of the duodenum were lifted upward and turned over upon the cardiac portion (the constricted part acting as a hinge), and united to it by a single row of fine silk sutures in the form of an ellipse, four inches in length, and one inch and a half in width. One suture was left long on either side of the ends of the ellipse, to indicate the space enclosed by the line of sutures, and to serve as a guide for making the communicating incisions in the stomach. The sutured surfaces were somewhat nearer the greater than the lesser curvature of the stomach.

The complete joining of the two portions before making the communicating incisions between them was done in order to avoid spilling any of the stomach contents into the peritoneal cavity, and was original with the operator.

The operation was now continued by making an incision through the upper part of the turned-over pyloric portion. Through this opening, a communicating incision, three inches in length, between the two portions of the stomach, united within the sutured ellipse, was made; this allowed examination of the stricture from within the stomach. The stricture was found to be dense and non-dilatable, and barely admitted the little finger. The edges of the communicating incisions were in part sewed over and over, so as to prevent their uniting. The incision through the pyloric portion of the stomach, which had given access to its interior, was sutured, the stomach returned to the abdomen, and the abdominal wound completely closed.

The patient rallied twelve hours after the operation. She vomited twice in the first twenty-four hours, but not afterwards, and was free from all pain after the second day. She was kept on nutrient enemata for the first five days, then fed by the mouth very cautiously with liquids. On the tenth day she was given solid food; on the twenty-first day she was eating heartily, and was out of bed.

The return of strength and gain in weight were rapid.

At the time of the operation Dr. Watson was not aware that any operation like this had been done before, but subsequently found this was not the case. Wölfler performed a similar operation for the first time upon a female, thirty-seven years old, on May 22, 1894. Four months later he reported the case (*Beiträge zur klinische Chirurgie,* XIII, I, 1894). At that time the patient was in excellent condition, had gained steadily in weight, and appeared to be fully restored to health. Eiselsberg (*Archiv für klinische Chirurgie*, 1895, Band L, Heft 4) followed with a second case in September of the same year, the patient being "a woman twenty-eight years old, who had symptoms of pyloric stenosis with hæmatemesis; a hard tumor could be felt in the region of the stomach. On October 25, 1894, laparotomy showed an hour-glass contraction of the stomach (the constriction being nearly in the middle of the organ), due to an ulcer of the stomach which had cicatrized upon the anterior wall, forming a hard cicatricial mass nearly encircling the entire circumference of the organ. The incision in the pyloric end in this case was unfortunately carried too close to the strictured portion, and, indeed, extended somewhat into it, which resulted in a tearing out of the sutures on the second day, from which there resulted a fatal peritonitis."

The writer calls special attention to his method of making the anastomosis in this case. It has the advantage of making it easier to prevent the pouring out of stomach or, if performed upon the bowel, of the intestinal contents into the peritoneal cavity. The long sutures left at each corner of the ellipse, when drawn upon, define its form and limits to the touch, so that the communicating incisions can be safely made.

A recent note from Dr. Watson, seventeen months after the operation, states that his patient has remained perfectly well since this operation and has maintained her gain in weight, except for a period of two months, when she lost eleven pounds, owing to hard work, but afterwards regained it.—*Boston Medical and Surgical Journal*, April 2, 1896.

II. Results with the Murphy Button in Intestinal Union at the Heidelberg Clinic. By PROFESSOR CZERNY (Heidelberg). The author has convinced himself from Marwedel's experiments on animals that the Murphy button results in a smooth union of the intestine without pseudo-membranous adhesions, and that the openings show no tendency to contract. The button was employed in the Heidelberg Clinic in thirteen cases. In one case, the attempt to implant the end of the ileum laterally into the colon was unsuccessful, as the hypertrophy of the upper segment prevented its being secured by the button. In all the other cases union was effected without any difficulty. Although there were three deaths after operation, in only one case can the button be held responsible; the use of too large a button caused pressure necrosis and secondary perforation. The other two fatal cases occurred in extensive gangrenous herniæ, and could not have been prevented by any method. The button usually passed in eight to twenty-one days, but a case of gastro-enterostomy was allowed to leave the clinic in a perfectly satisfactory condition, although the button had not been seen. Like every method, the use of the button requires experience, but the technique is easier to acquire than the usual double intestinal suture, which the author still holds to be yet the best method.

The great disadvantage of the method is the remaining of a heavy metallic foreign body in the intestinal canal, and while it remains must necessarily cause anxiety concerning the ultimate fate of the patient. Efforts should be directed towards the construction of buttons of such material as will in time entirely or partially be dissolved in the intestine. The Murphy button has not yet solved the problem of intestinal union, but it forms an important step in its perfection and deserves further trial.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXV Congress, 1896.

III. Combination of Gastro-Enterostomy and Entero-Anastomosis. By DR. VON BUNGNER (Hanau). While the recommendation of Braun, to combine with the original operation of gastro-enterostomy an entero-anastomosis to assure the functional result, has received but little recognition, it may still become necessary to perform the anastomosis at a later period as a second stage of the operation. In a case operated upon by the author, gastro-enterostomy failed utterly to relieve the pains and obstinate vomiting, and the patient was rapidly sinking. Entero-anastomosis between the afferent and efferent coils, performed a week later, at once dissipated all symptoms, and the condition for the remainder of the patient's existence was absolutely satisfactory. Such a procedure in not a few cases will be found useful in overcoming pain and prolonging life; the literature of recent years gives evidence that a not inconsiderable proportion of cases of gastro-enterostomy succumb owing to the omission of this second step.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXV Congress, 1896.

IV. Two Hundred and Nine Laparotomies for Gall-Stones. Dr. H. Kehr (Halberstadt). Two hundred and nine operations for biliary calculi, performed between May, 1890, and May, 1896, divided into cholecystotomy in one sitting, 97; in two stages 3, ideal cholecystotomies 4, cysticotomy 23 cases, with one death (patient, sixty-four years old, with arterio-sclerosis and emphysema), a total of 127 conservative operations on the gall-bladder with only one fatal result. In 21 cholecystectomies there was one death. In 30 choledochotomies and 1 choledocholithotrity two deaths, both very weak and profoundly jaundiced patients. In 17 cases no gall-stone was found, two deaths; 10 out of nineteen patients with carcinoma of the biliary passages or diffuse purulent inflammation died.

The mortality following operations for gall-stones depends directly on the pathological condition and the severity of the disease and the method employed. Early operations, where the stone has not passed beyond the cystic duct, should, in the absence of severe complications, exhibit a mortality of zero. For cholecystectomy and choledochotomy it should be 5 to 6 per cent.

Stones were left behind five times in choledochotomy; in three cases it was necessary to repeat the operation; on two occasions the stone was removed by reopening the wound in the common duct.

The experience of the surgeon from numerous *autopsies in vivo* has enabled him to obtain a much better knowledge of the conditions which require operative interference. Cases of cholecystitis and empyema and all the severer complications caused by cholelithiasis belong unquestionably in the domain of surgery alone. A diagnosis of "gall-stones" alone is not sufficient, the surgeon should perfect himself in the special diagnosis of the varieties of cholelithiasis and be able to distinguish what feature of it is to be treated. Such endeavors will greatly diminish the prestige of the customary therapeutic measures and open the way to the performance of early operations.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXV Congress, 1896.

V. A Retrospect of the Evolution of the Surgery of the Gall-Ducts. By C. LANGENBUCH (Berlin). Knowledge of diseases of the biliary system is of comparatively recent origin, the past history of medicine containing but few references on the subject. Some experiments on animals had been attempted in the early part of the seventeenth century, and, according to Courvoisier, gall-stones had been removed from the human subject by Van der Wiel (1678), Amyand (1738), and Müller (1742), but these operations were the result of accident rather than of deliberately planned operations. To the French surgeon, Jean Louis Petit, must be awarded the credit of first systematically devising a method of operation. His procedure was limited to cases where the diagnosis of adhesion of the gall-bladder to the abdominal parietes was established. He operated thus in at least one case with success, in several sittings. The next advance was made by Block, of Berlin (1774), in seeking to provoke the formation of adhesions of the bladder to the abdominal wall, and he achieved three successes by this method of operating. Then August Gottlieb Richter, of Göttingen, advanced the proposition that adhesions were not absolutely necessary to obtain success, that the free gall-bladder should be attacked. Half a century elapsed before any radical departure from these older methods, when Thudichum, a German surgeon established in London, put on record a method which is absolutely identical with the present form of operation,—cholecystotomy in two stages. His teaching remained, however, absolutely unnoticed for the next eight years, during which practically nothing was done in biliary surgery.

Cholecystotomy in the proper sense of the word, an operation performed in one sitting, was first performed by Bobbs in America. His experience again remained ignored, and other surgeons—Dahly and Maunders, then Hanfield Jones, Blodgett, and Brown—successively entertained the belief of having devised a new operation. Not till ten years later was a second operation performed according to Bobbs's method, this time by Marion Sims. The credit of performing the first successful cholecystotomy in two stages with suture of the gall-bladder to the abdominal wall belongs to König (1882).

The year 1882 marks the beginning of the third period of the evolution of gall-bladder surgery, and the long-delayed interference in diseases of the biliary passages was now developed in a veritable outbreak of surgical activity. The dominating impulse in future progress is ascribed by many to a German surgeon (Langenbuch) as the result of his demonstration of the feasibility of extirpating the gall-bladder when biliary calculi exist. On July 15, 1882, Langenbuch first performed the operation of cholecystectomy, resulting in the hoped-for cure of his patient. Several more such operations followed in rapid succession, performed by Langenbuch, Courvoisier, Riedel, and Thirial. The same year (1882) saw the birth of still another operation, cholecystenterostomy, first performed by von Winiwarter, under great difficulties, in six sittings. In 1885, Th. Roth, a Swiss surgeon, advocated implantation of the cystic duct into the intestine for the relief of obstruction both of the common and cystic ducts. Murphy, in 1894, further amplified the technique by the introduction of his well-known button.

The year 1884 saw the first attempts in surgical interference on the common duct. Choledocho-duodenostomy was first performed by Riedel and Sprengel. The first to do a choledochotomy were Kümmel (unsuccessful result) and Courvoisier, the latter successfully. The first successes in indirect choledocho-lithotrity were obtained by

Langenbuch, Courvoisier, Credé, Kocher, and Sonnenburg. Laparotomy for acute ulcerative perforation of the gall-bladder was performed by Küster in 1884, and, secondly, by Mikulicz.

Ideal cholecystotomy was recommended by Spencer Wells in 1883. After two unsuccessful results in the hands of Meredith and Gross, Courvoisier obtained a successful result in 1884, and further successes were soon recorded by Küster and Heusner. Cholecystopexy, a modification of the ideal operation, was first performed in Germany in 1888, examples of this operation having previously been recorded in America by Parkes and Carmalt. In 1884 Riedel was successful in operating for the relief of a fistula of gall-bladder, communicating with the right pleural cavity as well as the colon. In 1886 Krönlein closed a fistula between the biliary and urinary passages. In 1887, von Bergmann evacuated gall-stones from a patent urachus communicating with a perforation in the gall-bladder. Cystolithectomy through the substance of the liver was first performed by Landerer in 1886, and Lauenstein also did a hepatolithectomy in two stages. In 1890, Hochenegg was the first to remove the gall-bladder for malignant disease. Omental grafts for shutting off incisions in the biliary tracts were first employed by Courvoisier, Robson, Lauenstein, and Sendler; Riedel and Lauenstein were the first to operate for the relief of pain caused by peritoneal adhesions. The first ideal cysticotomy (in this case combined with ideal cholecystotomy) was originated by Küster. Ideal cysticolithectomy unaccompanied by any intervention on the gall-bladder was successfully accomplished by Greiffenhagen, in Reval, in 1890.

While the above array of facts relating to the developments is most imposing, the author acknowledges that much has been left unsaid, and many distinguished names omitted. The most notable fact seems to be the great rapidity with which surgery of the gall-tracts, after laying dormant till 1882, produced method after method of operation when once the stimulus to its development had made itself felt.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXV Congress, 1896.

CHARLES L. GIBSON (New York).

GENITO-URINARY ORGANS.

I. Observations upon the Renal Circulation. By M. Destot (Lyons). The venous and arterial circulation of the kidneys have been studied recently by M. Destot, and the results reported. Thin mercurial ointment was the injecting mass used, and after the vessels had been well distended the resulting semi-metallic lines were studied by means of radiographs. There are no anastomoses between the arterial channels, but the veins communicate freely.

It was found that the renal artery divides into an anterior and a posterior branch, supplying corresponding segments of the kidney separated by a plane midway between the dorsal and ventral faces. There appears to be no anastomosis between these two portions, and in the operation of nephrotomy, therefore, the line of incision should follow the convexity of the organ parallel with the liver and between the two vascular segments, thus avoiding any serious hæmorrhage.

Sections were also made and studied of single lobes which had been injected. These sections could be made of considerable thickness, and so gave much clearer idea of the relation of the vessels than could be obtained from micro-photographs. When the cut was at right angles to the long axis of the principal vessel the branches were seen to radiate from the main trunk. If parallel with the vessel, the vessels passed out at the sides very like the arrangement of branches in a fir-tree; the glomeruli were usually reached by the shortest possible route. There is no arterial connection between adjoining lobules, and the arteries end in minute capillaries. With the veins the condition is quite different; the anastomoses are numerous, and through a single vein the entire organ can be injected. —*Lyon Médical,* 1896, Nos. 49 and 50.

Henry P. de Forest (Brooklyn).

II. Suppurative Inflammation of the Fatty Capsule of the Kidney. By Hugo Maass (Berlin). The fatty capsule of the kidney, owing to its vascularity and loose cellular tissue, is especially predisposed to the development and extension of suppurative processes. The deep-seated pus forcing its way out to the surface only slowly and with difficulty, large retroperitoneal abscesses accompanied with severe local and general symptoms develop and threaten life by their proximity to important organs. Hence the importance of early diagnosis and surgical interference. The seat of these abscesses is for the greater part posterior to the kidney where the fatty capsule is most developed. If the abscesses begin at the upper or lower pole of the kidney they generally extend into this posterior region in a short time. Occasionally they may remain localized in one direction, upward towards the diaphragm, or downward following the course of the ureter. The etiology of perinephritic abscess is as yet not fully enough understood. A study of the literature shows that often no etiological factor is discovered, or is attributed to such vague causes as taking cold, strain, habitual constipation; consequently for more than half of the cases the causal factor must be considered obscure. The conditions are clearest and simplest when the condition can be defined as a secondary process from extension of some neighboring focus usually of renal origin,—pyelonephritis and pyelitis of calculous origin being the commonest. Next in etiological frequency come the suppurative processes of the pelvic fascia, such as follow gonorrhœal urethritis and its sequelæ in the male, puerperal infection in the female, and operations on the bladder and rectum. Disease of the thoracic organs, such as gangrene of the lung and empyema, while less frequent than inflammation of the pelvic organs, is more often the source of a primary focus than the suppuration of the retroperitoneal structures. The term "primary suppuration"—that is, where there is no evidence of transmission from a local focus—should be looked upon with distrust, for there is no doubt that a large part of these apparent primary processes are in reality of metastatic origin. For recent investigations have shown that a considerable number of seemingly idiopathic conditions may owe their origin to insignificant and unobserved superficial suppuration, cutaneous abscesses, boils, wounds, etc., and the relationship of these factors to a metastatic process in the perirenal fat has been frequently demonstrated, and the number of such observations is an evidence of their etiological relation. The anatomical conditions of the fatty capsule and its anastomosis with the vascular system of the kidney constitute an admirably predisposed soil. Bacteria can be and are undoubtedly filtered through from the kidney into its surrounding fat, and the suppurative process thus set up may represent the only existing secondary deposit. Israel's case of a patient with carbuncle on the neck and perinephritic abscess is here recalled. On evacuation of the pus the exposed kidney was seen to be the seat of an inflammation so typical of the carbuncle on the neck that Israel has recorded it as a case of carbuncle of the kidney. While some of the cases may develop without evidence of extension of a metastatic deposit in the kidney, it must be remembered that in many operations the condition of the kidney is not clearly made out or the foci are so small as to be unrecognizable and unaccompanied by urinary manifestations.

Pain in the affected side is the first and most constant of the local symptoms, antedating the appearance of an evident tumor by a considerable period. Pressure symptoms are important, varying naturally with the site of the abscess. Pressure on the colon may be so great as to simulate closely intestinal obstruction. Œdema and venous stasis may follow compression of the vena cava. In the subdiaphragmatic variety there may be a spasm of the diaphragm or implication of the pleura. When pus travels along the course of the psoas muscle, flexion of the hip and neuralgia of the genitals are observed. The constitutional symptoms present as many varying phases as the local, but the sickness generally begins with the manifestations of a severe general infection. The various symptoms—local and general—may abate, and there may be an apparently spontaneous improvement, lasting months or even years, but finally an insidious cachexia develops which gives the disease the appearance of a malignant growth. The whole course of the affection presents naturally marked differences according to its etiological factors.

Diagnosis is usually quite easy in advanced cases, but at the onset may be quite obscure, owing to the seat of the process and to the circumstance that we are not dealing with an organ, and therefore evidences of disturbance of function are not available. Careful physical examination is necessary; the lumbar region should attract attention at an early period as the seat of pain. Exploratory aspiration is the most valuable aid; it almost invariably reveals pus rich in fatty elements.

There is only one possible treatment,—evacuation by a lumbar incision. All pus cavities should be sought for and broken down. Whenever possible, the kidney should be exposed, and the operator should be ready to deal with whatever conditions it presents. The wound should be packed; it usually closes rapidly.

Detailed reports of twenty-two cases from Israel's practice are appended. There were five deaths.—*Sammlung klinische Vorträge*, No. 170, 1896.

III. Resection of the Bladder with Displacement of the Ureters. By E. KÜSTER (Marburg). Two successful cases of extirpation of new growths of the bladder implicating the ureters are reported. In the first case, a woman, forty-one years old, cystoscopic examination showed a villous polypus surrounding the opening of the right ureter,—suprapubic cystotomy. The tumor was the size of a cherry, and was removed by an elliptical incision, including the mucous membrane as well as the lower part of the ureter. The end of the ureter was incised lengthwise and united to the wound of the mucous membrane, forming a crater-like opening. Suture of the bladder with silk, the rest of the wound left open, and united four days later with silver sutures; primary healing both of the bladder and soft parts in a short period of time. Cystoscopic examination, four days later, showed perfect healing with preservation of the funnel-shaped opening.

In the second case, a man, aged thirty-two years, hæmaturia and other symptoms had existed for four years. Cystoscopic examination fruitless, but bimanual examination showed the presence of a large tumor occupying the right half of the bladder. March, 1896, suprapubic section, and removal of a large oval-shaped portion or the entire thickness of the bladder wall and resection of several centimetres of the ureter. Suture of the ureter as in the previous case, in the upper angle of the bladder-defect which was sutured throughout. The bladder was left open. Later secondary suture of the bladder, all except lower angle where a fistula still remains. The tumor proved to be an endothelioma. The patient continues to remain perfectly well, and there are no bladder symptoms.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXV Congress, 1896.

CHARLES L. GIBSON (New York).

BONES AND JOINTS.

I. Gonorrhœal Arthritis. By DR. KÖNIG (Berlin). In any acute inflammation of the joints it is always advisable to examine the urethra. In 90 per cent. of the cases one finds a urethritis. It is, therefore, justifiable to conclude that the most frequent form of arthritis is the gonorrhœal and not the tubercular. Many of the cases of puerperal arthritis as well as those of chronic articular rheumatism in women are gonorrhœal. The disease affects both sexes in about equal numbers. In women the wrist, in men the knee-joint are most frequently affected. Gonococci have been frequently found in the joints. In many cases staphylococci, streptococci, and pneumococci are found. The cases may be divided into four groups: the first, one in which effusion alone occurs; a second, with fibrin formation and capsular thickening; a third, the latter condition associated with para-articular phlegmons with involvement of the tendons and ligaments; lastly, one in which ankylosis occurs very early, much fibrin, infiltration of ligaments, etc. There is the greatest tendency for the joint ends of bones to grow together. The treatment of gonorrhœal arthritis should be puncture of the joint and injection of carbolic acid solution in cases of simple effusion. In those in which there is para-articular infection, it is necessary to open the joint and wash it out. In cases of threatening ankylosis, mobilization. To relieve the pains the application of plaster casts has been found efficacious. But this tends to produce ankylosis, and hence the administration of forty-five grains daily of potassium iodide, and injection of iodoform emulsion should first be tried.—*Centralblatt für Chirurgie,* No. 48, 1896. DANIEL N. EISENDRATH (Chicago).

II. Osteoplastic Splitting of Bones. By K. CRAMER (Cologne). Bardenheuer has further developed the method reported by him in 1894 of a partial section in the long axis of various bones for the obliteration of defects. In his new method the bones of the metatarsus were split lengthwise to fill up the gap in an adjoining metatarsal. A good result was obtained in five cases. The method was extended still further on the metacarpus. In four cases a metacarpal bone having been split lengthwise, one-half was bent over, overcoming the deformity resulting from the extirpation of a neighboring metacarpus. In these cases, also, the results were very satisfactory. Section of the bone is easily performed with a fine sharp chisel, the bone being left intact at one of the joint surfaces. The displaced half is made somewhat thicker than the remaining one. Necrosis of the dislocated bony fragment was never observed.

In the case of deformity following the loss of the second metatarsal and of the proximal two-thirds of the first metatarsal, the third metatarsal bone with the adjoining external cuneiform were bodily separated as far as the region of the metatarso-phalangeal joint, at which point the metatarsal remained attached to the neighboring soft parts. Both bones were then dislocated, bringing the external cuneiform in front of the middle cuneiform.

The remaining stump of the first metatarsal was refreshed and fastened to the dislocated third metatarsal. Again the result was perfectly satisfactory. The principle was further developed in cases where the proximal phalanx, together with its metatarsal or metacarpal bone was wanting by splitting the corresponding adjoining bones and bodily transposing them. The process was similarly employed in defects of the radius.—*Verhandlungen der deutschen Gesellschaft für Chirurgie,* XXV Congress, 1896. C. L. GIBSON (New York).

REVIEWS OF BOOKS.

THE SURGERY OF THE ALIMENTARY CANAL. By A. ERNEST MAYLARD, M.B., Surgeon to the Victoria Infirmary, Glasgow. 8vo, pp. 724. Philadelphia: P. Blakiston, Son & Co., 1896.

The portion of the alimentary tract considered in this treatise extends from the commencement of the œsophagus to the termination of the rectum proper, excluding the pharynx and the anal portion of the gut, and also external herniæ. The œsophagus, the stomach, the small and large intestine, and the rectum present, certainly, a sufficiently large field for attention, and one which, in all its parts, possesses sufficient likeness of conditions to make it possible to subject them throughout with advantage to similar methods of study and presentation. No portion of the body has drawn to itself more attention during the past fifteen years nor rewarded more fully the attempts that have been made for the diagnosis and relief of its affections than has the alimentary canal, and a full, scholarly, and critical study of recent surgical effort in all portions of its extent is both timely and valuable. This is what Mr. Maylard has given in the book before us. The general descriptions and discussions of the text are supplemented by frequent case details. Some of these are from the experience of the author, but the great mass of them have been culled from recent current British literature; a fair proportion are from American sources, while French and German experience is but rarely cited. They are always apropos and instructive and, perhaps, all the more valuable for the limited range of territorial limits which they represent. The work is copiously illustrated, a noticeable feature being the full page half-tone plates, of which there are seventeen, and which are photographs of specimens in Glasgow museums.

Some of these are most excellent specimens of what can be done in this method of illustration, notably Plate VI, diverticulum of the œsophagus, and Plate XVI, Meckel's diverticulum of the ileum, and the plates illustrating carcinoma of the colon. The reader will find in the pages of this book a very full digest of the literature of surgical affections of the alimentary canal. It has evidently been his aim to omit nothing of proved value that has been evolved in this field by surgeons in all countries; the success with which he has accomplished his task is very satisfactory. He acknowledges in his preface his indebtedness to the "Index Medicus" and to the "Annual of the Universal Medical Sciences" for references to the literature of his subject. Just here is a point where he lays himself open to criticism, for examination of the book shows that he has sometimes been content with references at second-hand when the original sources should have been made accessible.

The book is divided into four parts, devoted respectively to the œsophagus, the stomach, the small and large intestine, and to the rectum. Each section is introduced by a chapter devoted to anatomical and physiological considerations, and is concluded by one or more chapters in which are described the operations required for the relief of the conditions which have been discussed in the earlier parts of the particular section. The directions for operative technique are fairly full, sufficiently so to furnish the guidance needed by a practitioner who desired to do any particular operation. The section on the large intestine includes a discussion of appendicitis, which is very fair in its tone and comprehensive in its scope. The author states clearly the different views—the radical and conservative—held by surgeons as to the indications for operative interference in affections of the appendix; giving with sufficient fulness the reasons upon which the differing views are based, leaving to the reader the responsibility of deciding for himself the course to be pursued in a given case. The author contents himself with taking the position that these cases should be from the first under the charge of the surgeon and not the physician; not that they necessarily require operative treatment, but because the contingency of operation may arise in any case, and the continued oversight of the case by the surgeon can alone insure that promptness of action which in many cases is essential for the saving of life.

The book, as a whole, is not only comprehensive, critical, and judicious, but it is good reading withal; the style is clear and flowing; a full table of contents is prefixed, and a good index closes it. It is a valuable addition to surgical literature.

LEWIS S. PILCHER.

THE AMERICAN YEAR-BOOK OF MEDICINE AND SURGERY: being a yearly digest of scientific progress and authoritative opinion in all branches of medicine and surgery. Under the general editorial charge of GEORGE M. GOULD, M.D. Large 8vo, pp. 1183. Philadelphia: W. B. Saunders, 1896 and 1897.

1896. The first volume of the "American Year-Book" contains an abundance of valuable information, yet it cannot be said that it has been confined to the year limitations prescribed by its title, as will be shown. Its corps of editors includes only men of assured ability, the majority of whom are representative physicians or surgeons of Philadelphia.

Considering the various articles *seriatim*, we begin with that treating of general medicine. This is carefully compiled and edited and comprises 162 very interesting and instructive pages. Particularly pleasing are the chapters on typhoid fever, epidemic influenza, malaria, and the diseases of the blood and of the ductless glands. Many interesting investigations regarding diseases of the gastro-intestinal canal and their treatment are reported.

In reviewing the section on General Surgery we are obliged to conclude that it has been written hurriedly, for, like all dashing literary productions, it is most excellent in some places and sadly lacking in others. Sometimes it is surprisingly inconsistent with the granted ability of its authors. Reports of the treatment of mammary carcinoma, by Halstead and Bull, are condensed into valuable summaries. The pages on appendicitis seem to be written carelessly, apparently as if the aim was to amuse rather than to help the general practitioner. Much space is devoted to the unstable whims of certain of our able and eminent but over-enthusiastic surgeons, while a great quantity of careful investigations, which have been carried on in various places, are unreported. Again, some of the paragraphs, notably the last on page 205, contain information that has been included in many of the text-books of the last decade. We are disappointed in this article. The essay on hernia is full of well-selected and helpful reports.

Intestinal surgery has certainly taken a long step forward during the past two years, and the "Year-Book" tells this story well. In proportion to the gains made in this department, the discussion of the surgery of the gall-bladder is insufficient.

Several new operations upon the stomach are clearly described. The reports of operations upon the spleen are as encouraging as they are startling. To render the pages on fractures, dislocations, and joint-surgery more full and attractive, the editors have drawn upon the work of the past five years and more, which seems inconsistent with the title "Year-Book." This is noticeable elsewhere, but here it is especially evident. The progress of intracranial surgery is most ably described. The article on venereal diseases is brief and comparatively uninstructive. Certainly much more valuable information concerning anæsthetics could have been collected from the work of the past year than is here contained.

The review of the advances in obstetrics is well written and rather satisfactory altogether. It is crowded with clinical reports. Much interesting information concerning the pathology of the fœtal appendages is furnished.

Ectopic gestation is treated of ably. A new classification of these cases is inserted, but it is too elaborate to be of practical value. In the argument for and against symphyseotomy the negative disputants are not allowed on the floor.

A wealth of clinical reports have assured us of the magnificent advances in the surgery of the female pelvic organs during the past five years, and it has doubtless been a much easier task to complete an article covering a certain number of pages by drawing upon this profusion of literature than it would have been to have confined attention to the limited reports of the single year. The well-constructed article on gynæcology is thus almost totally inconsistent with the title of the volume. The same may be said of the succeeding article (pædiatrics), although it is pleasant and profitable reading. Nor does the neurologic treatise refer to many reports within the year specified, but we commend the pages as valuable ones. Except for one short paragraph, the lines on dermatology and syphilis could have been published on the first day of the year with the work of which the authors were supposed to deal.

The six pages devoted to orthopædic surgery are exceedingly clear and practical, while ophthalmology is treated of too elaborately, chiefly because of repeated drafts upon the literature of previous years.

The pages delineating the advances in otology, rhinology, laryngology, and pathology are good, but, again, are too old for this "Year-Book." Materia medica and therapeutics are treated of satisfactorily. Here, again, however, we see the cardinal fault of the work. The writers on anatomy, physiology, hygiene, and clinical chemistry, and on medical jurisprudence have presented some valuable paragraphs.

Considering the volume as a whole, it seems to be not so much a "Year-Book" as an account of the general and special medical and surgical work of the past five years, although it is none the less valuable on this account. Also, it is too often apparent that the devotion of some of the compilers to neighboring friends has resulted in an over-generous supply of a local flavor to the book.

1897. Thoroughness of study of the medical and surgical literature of other countries, persistency and care in research, and a positive gain in presenting acceptable, telling, clinical reports and scientific essays mark this volume. All of the pages devoted to general medicine give well-written reports of important work, with a pleasant combination of detail and conciseness.

The chapter by the general surgeons is a marked improvement over that of the last volume. Every page is good. There is a valuable article on anæsthesia and anæsthetics, with an especially interesting discussion of the value of infiltration anæsthesia. The pages on abdominal surgery are most excellent. Many of the anastomotic bobbins and buttons are discussed and the results of their employment reported. The reports of surgical work upon the respiratory system are entertaining and impressive. Fractures and dislocations are dealt with thoroughly. Advances in vesical surgery are well reviewed. An extremely careful *résumé* of the work with the Röntgen ray is presented. The closing pages of the surgical review (military surgery) are as interesting as any within its confines, and we are surprised and delighted to note that the most extensive and accurate studies of bullet-wounds have been made in this peaceful land. Obstetrics is a well-written compilation of reports of studies from every corner of the world where the obstetricians are scientists.

The subject of gynæcology is handled ably. Particularly thorough is the report of the advances in pathology, diagnosis, and treatment of malignant disease of the uterus.

The chapter on pathology is thorough and exceedingly instructive.

Nothing could be more satisfactory in its line than the section dealing with pædiatrics. Perhaps the best pages are those given to infectious diseases, including a comprehensive report of the discussions concerning the treatment of diphtheria.

In the treatise on nervous diseases it is pleasing to observe that due attention has been paid to most minute details and the rarest maladies, making the pages very valuable for reference.

The work upon orthopædic surgery is, again, brief, but, again, excellent.

Ophthalmological advances are acceptably reported. In this section are three most excellent plates and several good diagrams. The recent work in otology is carefully summed up, likewise that in rhinology and laryngology. The article dealing with dermatology and syphilis is too inflated, but beautifully illustrated.

Accuracy and aggression are the leading characteristics in the lines on materia medica, and they are comfortingly free from the useless details that sometimes serve only to bewilder. The reports of the uses of animal extracts (most notably that of thyroid glands) are especially interesting and helpful, while every page is more than valuable.

Although the paragraphs on anatomy cannot deal with essentials they are instructive and pleasing. Many interesting investigations in physiology are well reported. Brief reviews in medical jurisprudence, hygiene, and clinical chemistry are combined in the last chapter, which is one of the most satisfactory in the book.

With the brief *résumé* of recent work at the beginning of each section and the leading line of each paragraph in heavy type the value of the volume as a reference hand-book is greatly enhanced. We deprecate the indefiniteness of aim as to the time covered and the date of issue of these "American Year-Books," but recommend them as valuable works to all who desire to keep in touch with the advances of modern medical and surgical science.

CHARLES H. GOODRICH.

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FURTHER OBSERVATIONS ON FRACTURE OF THE NECK OF THE FEMUR IN CHILDHOOD, WITH ESPECIAL REFERENCE TO ITS DIAGNOSIS AND TO ITS MORE REMOTE RESULTS.[1]

By ROYAL WHITMAN, M.D.,

OF NEW YORK.

IN 1890, at a meeting of the Orthopædic Section of the Academy of Medicine, I presented a case of fracture of the neck of the femur in a boy eight years of age, and again in 1892 four cases in children from two to six years of age before the members of the Surgical Section. Since that time five others have come under my observation, and I again present the subject for discussion together with several of the patients to illustrate the recent and more remote effects of the fracture.

The nature of the injuries sustained by these patients and the character of the symptoms and appearances observed are, in brief, as follows:[2]

CASE I.—A boy, aged eight years, was brought to the Hospital for Ruptured and Crippled in the arms of his mother on May 20, 1890. Six weeks before he had fallen into an area, a distance of fourteen feet, injuring the right leg. He was put to bed and treated by a physician who devoted his attention to the knee, which was said to have been swollen. Later, another physician was called who pronounced the condition hip-disease, and said that it was incurable. On examination it was noted that the leg was rotated outward, that the trochanter was elevated three-fourths of an inch above Nélaton's line, and was somewhat nearer the median line of the body than its fellow. Passive motion of the limb caused pain, but was unrestricted except in extreme flexion and inward rotation. The head of the bone was evidently in its place. A hip-splint was applied, on which the child immediately began to walk. Six months later it was discarded.

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[1] Read at a meeting of the Surgical Section of the New York Academy of Medicine, February 8, 1897.

[2] The more immediate effects of the injury in Cases I to V have been reported,—*vide* "Observations on Fracture of the Neck of the Femur in Childhood, with especial Reference to Treatment and Differential Diagnosis from Separation of the Epiphysis," Medical Record, July 25, 1893.

The examination, two years later, October 20, 1892, showed practically free motion in all directions. It was said that the child complained somewhat of stiffness after long sitting. This was explained by the marked projection of the trochanter, which distended the gluteal region when the leg was flexed. Otherwise the child suffered no discomfort. There was a slight limp and one-inch shortening, an apparent increase of one-fourth of an inch since the first examination. The legs were three inches longer than in 1890. The present condition of the patient will be considered later. (See Figs. 5 and 6.)

Case II.—A boy, aged six years, was brought on November 9, 1891, to the hospital, on account of a persistent limp. Four and a half months before he had fallen from a fire-escape, a distance of fourteen feet, the accident being followed by swelling of the thigh, pain, and inability to stand. A plaster-of-Paris bandage had been applied and had been worn for eight weeks, on its removal the boy appeared well, with the exception of the limp.

The examination showed, as in the preceding case, slight outward rotation of the limb, prominence of the trochanter, which was elevated three-fourths of an inch above Nêlaton's line, with two-thirds of an inch displacement towards the median line. There was limitation of motion, except in extreme flexion and inward rotation. A brace was worn for three months, and then removed. The child was examined on December 10, 1892, one year later. The shortening then was one and one-fourth inches, the other leg having increased one and a half inches in length. The only symptoms remaining were the limp caused by shortening and a slight limitation of motion.

Case III.—A boy, aged five years, was brought to the hospital December 28, 1891; he was said to have been thrown down or run over by a heavy carriage nine weeks before. At this time there was pain and swelling of the thigh, for which a plaster bandage was applied; it was removed two weeks later. The patient had since walked with marked limp, and suffered more or less pain. Examination showed the leg in full extension, somewhat rotated outward, three-fourths of an inch shorter than its fellow, with a corresponding elevation of the trochanter, which was, however, much less prominent than in the preceding cases; motion was much more limited, terminating at 100 degrees of flexion, and the muscular resistance was more marked.

In this case it was inferred that the upper extremity of the bone had sustained more damage than in the preceding cases, which was borne out by the after-history; the spasm and resistance to motion necessitating the use of a brace up to the present time (December, 1892), when it is being gradually discarded. There has been no change in the appearance; motion is now perfect in extension, somewhat limited in flexion. The relative shortening is as on the first examination. The present condition of the patient is unknown.

Case IV.—A boy, aged eight years, applied at the hospital October 8, 1892, with a history of a fall of about fifteen feet six months before, followed by pain and disability, for which he was treated at the Gouverneur Hospital.

The appearance in this case was very similar to the preceding. The right trochanter was elevated one inch above Nêlaton's line, there was marked thickening about the joint and muscular spasm on motion. The leg was fully extended and rotated outward.

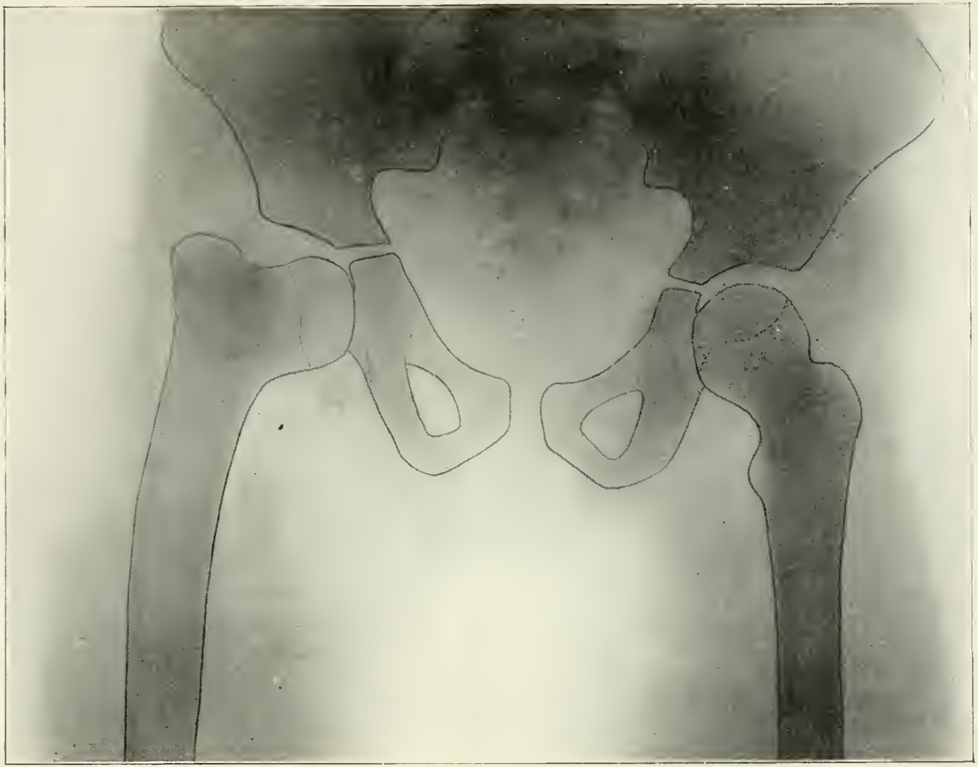
Dr. Silver has kindly furnished me with the history of the case. On the child's admission to the hospital he was anæsthetized, and a diagnosis of fracture of the neck of the femur at its junction with the shaft was made. There was distinct bony crepitus at this point, and the trochanter rotated on its own axis. At first Buck's extension was applied, but as the child was unruly a plaster-of-Paris spica was substituted. On its removal the boy walked fairly well, but as the pain and limp had recurred since his removal from the hospital, some support was thought necessary. This, as in the preceding case, was applied and at once relieved the pain and night cry. It was discarded about two months later. The condition of the patient at the present time will be described in the consideration of the remote results of the injury.

Case V.—A boy, two and a half years of age, was brought for examination in October, 1892. One month before he had fallen from the fourth story of a house, but did not appear to be seriously injured. He had since limped and complained of pain and fatigue in the left leg. Examination showed outward rotation but absolutely free motion of the hip, three-fourths of an inch shortening, with the elevated and prominent trochanter as in former cases. A modified hip-splint was applied, with relief of all symptoms. It was worn for six months. One year later there was no increase of shortening and no symptoms of discomfort. The present condition will be mentioned later. (See Figs. 7 and 8 and Skiagram of patient No. 5.)

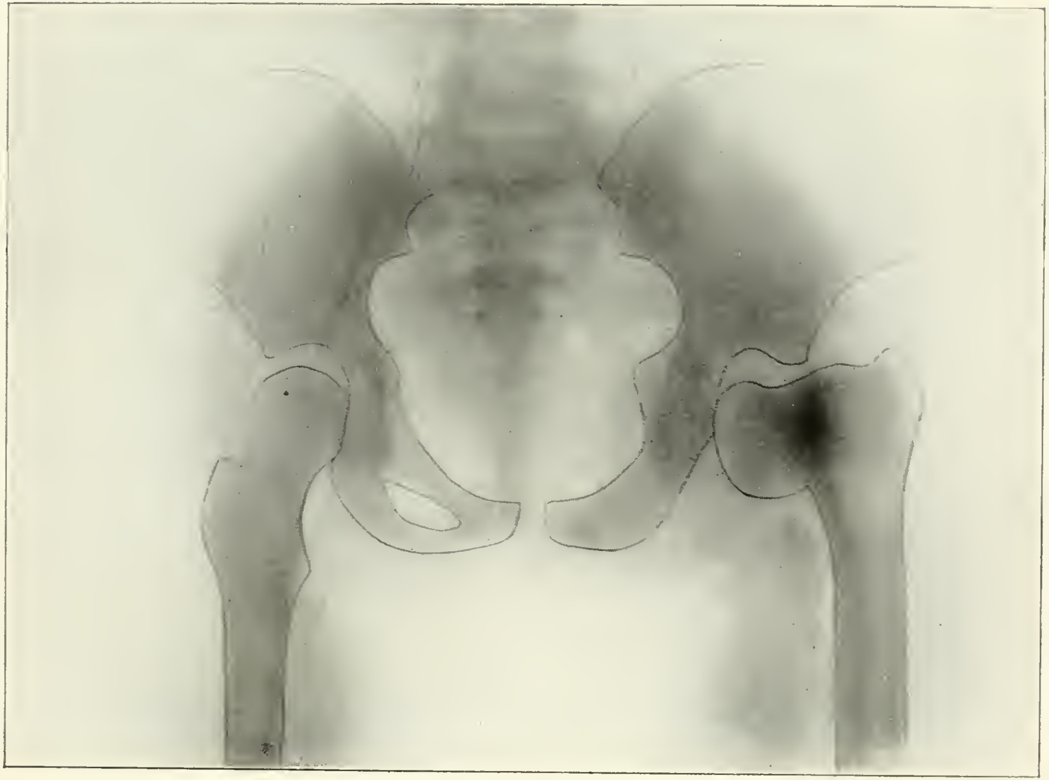
Case VI.—A girl, six years of age, was seen at the Vanderbilt Clinic September 4, 1894. Five months before she had fallen down a flight of stairs, and being unable to walk was placed in bed. No immediate diagnosis was made; later, after consultation, the child was said to have hip-disease, for which she had been treated by rest in bed with traction for several months. The examination showed limp, an elevated and prominent trochanter, three-fourths of an inch of shortening, and slight eversion of the limb. Motion was unrestricted. The mother did not again bring the child for treatment. A final examination was recently made, two and a half years after the accident (January 28, 1897). There is no decided change in the physical signs. There is, however, an increase of one-fourth of an inch shortening, slight eversion of the foot, and slight restriction of abduction. No discomfort or disability is complained of.

Case VII.—A girl, five years of age, was seen at the Hospital for Ruptured and Crippled September 12, 1895. Five weeks before the examination she had fallen down stairs. She was kept in bed two weeks, but then began to walk about as usual. She was brought to the hospital because of the limp and slight discomfort. The shortening was one-half an inch, with elevation and prominence of the trochanter, as in the former cases. She was not again seen, nor could she be found for a later examination.

Case VIII.—A girl, three and a half years of age, was seen at the Vanderbilt Clinic on September 21, 1895. About three weeks before she had fallen down a flight of stairs. There was no immediate treatment other than rest. She presented the usual signs of united fracture. The shortening was three-fourths of an inch. A plaster spica bandage was applied and worn for two months. There was no further treatment. At the present time, January 31, 1897, the shortening is one inch; there is still very slight limp. In this case there is marked restriction of abduction, for which the mother employs forcible manipulation, and an increase of one-fourth of an inch of shortening, showing that a hip-splint should have been applied to



Skiagram of patient No. 5, four years after the accident, illustrating the deformity of the neck and of the upper extremity of the shaft; also the elevation of the pelvis on the affected side.



Skiagram of patient No. 8, fifteen months after the accident, illustrating the depression of the neck of the right femur. Outlines traced on both skiagrams.

remove the weight of the body from the vulnerable neck. (See Fig. 9 and Skiagram of patient No. 8.)

CASE IX.—A girl, eight years of age, was seen at the Hospital for Ruptured and Crippled October 12, 1895. Six weeks before she had fallen about ten feet, injuring the right leg. There was much pain referred to the hip and knee. Two days later she was taken to a hospital, but no diagnosis was made. Since then she had remained in bed and been rubbed with liniment.

Examination showed the signs as in the preceding case, the shortening, however, being but half an inch. The mother did not again bring the child for treatment. At a recent examination, January 28, 1897, one year and a half after the accident, no disability remains. There is slight eversion of the foot, elevation and slight prominence of the trochanter. Motion is not restricted. The shortening has not increased. The mother states that the child continued to limp and complained of pain for nearly a year after the accident. This is the most favorable result of the cases reported.

CASE X.—A girl of seven years was seen at the Hospital for Ruptured and Crippled September 16, 1896. Six weeks before she had fallen from the third story of a house. She was in bed nine days. No immediate diagnosis was made. She was afterwards under treatment for hip-disease.

The usual signs of fracture were present. There was no pain and no restriction of motion, a very slight limp, and one-half inch of shortening. She was again seen February 2, 1897. The treatment for hip-disease had been discontinued. No disability was apparent, and no increase of shortening. A well-marked tilting of the pelvis was present, due to the shortening.

These ten children were seen by me at intervals of from three weeks to six months after the accidents. In but one instance had a previous diagnosis been made or treatment applied, and nearly all were referred by a physician or brought by the parents on the supposition that they were suffering from hip-disease. It will be noted that the accidents were of such a nature as might cause fracture and that the symptoms and appearances were those of fracture; moreover, the diagnosis which was in 1890 to be made only by a process of exclusion can now be demonstrated by the accompanying skiagrams of two of the patients. As was stated in my former paper, fracture of the neck of the femur is, or was at that time, practically unrecognized as a possible accident of childhood, nor is the subject now considered in text-books as distinct from that of the adult or aged person. It would seem, then, that the subject deserves further attention, and especially since the symptoms and effects of the fracture differ very materially with the age of the patient. From this stand-point the following divisions of the subject are of especial interest:

(1) The immediate diagnosis of the fracture.

(2) The differential diagnosis from hip-disease during the stage of recovery.

(3) The question of fracture *versus* epiphyseal separation.

(4) The immediate and remote effects of the fracture.

As regards the immediate diagnosis, it would seem that the evidence of injury about the hip, the elevation and projection of the trochanter, the change in contour, the shortening and eversion of the leg would have made the diagnosis clear, had accurate measurements been employed; but, on the other hand, it would appear from the fact that several of the patients were able to walk in a few days after the accident that the injury was a bending and breaking of the neck, a green stick or impacted fracture, rather than an actual separation, so that in the absence of the peculiar helplessness and evident shortening of the limb the injury might have been overlooked by one familiar only with the described and accepted type of symptoms.

This simply emphasizes the fact that, in childhood, a careful physical examination is the only reliable evidence of the presence or absence of disease or injury.

If a primary diagnosis has not been made, one can well understand how the subsequent limp, the pain referred to the hip and knee, and the pain and restriction of motion at the seat of the injury, might, as in these cases, be mistaken for the symptoms of disease, and yet the essential differences between the two should be sufficiently evident.

In all these cases the child was perfectly well until it received a severe injury which necessitated immediate confinement to bed for several days or weeks. This, in no sense, corresponds to the slow and irregular onset of tuberculous disease.

In from three weeks to six months after this primary disability, of which the symptoms had become less rather than more marked, the physical examination made evident a change in the contour of the body on the affected side, caused by the elevation and prominence of the trochanter, a shortening of the leg, and usually eversion of the foot. Such signs as the result of disease are evidence of an advanced stage of upward enlargement of the acetabulum or of partial destruction of the neck of the bone, conditions that would be accompanied inevitably by the evidence of local disease, by restriction of motion and deformity of the limb.

In fracture such signs are absent. During the early stages of repair, of weakness and pain, motion is somewhat restrained by muscular spasm and by the voluntary effort of the patient; but this restraint does not, as in tuberculous disease, affect every motion in equal degree; it is particularly marked in flexion, abduction, and inward rotation, corresponding to the direct effect of the depression and backward displacement of the neck of the bone. In fact, it would appear that mistakes are due rather because of failure to make a proper examination or to inaccuracy in the interpretation of obvious signs, than to any particular difficulty that diagnosis offers, either in the primary or the secondary stage of the injury.

The third point for consideration is of interest rather from the stand-point of accuracy than of practical importance. This is a question as to whether a fracture of the neck of the femur or a separation of the head of the bone at the epiphyseal junction is the more probable diagnosis after injury presenting such physical signs as have been described; for, although fracture has received no particular consideration, a number of traditional cases of separation of the epiphysis are recorded in the textbooks.

It would seem, in fact, to be the general impression that an epiphyseal junction is a weak point in the bone, and that the epiphysis may be easily jarred or otherwise separated from the shaft, so that a slight injury followed by symptoms of deformity or weakness at the hip-joint, and particularly if these symptoms be slight, are considered as arguments in favor of epiphyseal disjunction rather than fracture.

There is no reliable evidence to support this assumption, either in regard to the upper extremity of the femur or to any other bone.

The true epiphyseal separations, as verified by operation or autopsy or when produced experimentally, have been the result not of slight but of extreme violence, by which the periosteum was stripped from the shaft of the bone and in which reposition of the fragments was extremely difficult.

Such separations most often occur in those situations in which effective leverage may be applied directly to the epiphysis by means of its projecting processes to which the ligaments and muscles are attached, as at the lower extremity of the femur and humerus. Of all the epiphyses of the body that of the head of the femur is least liable to such leverage, and great violence would be much more likely to fracture the neck or to dislocate the femur than to cause a separation at the epiphyseal junction, which is the widest and strongest and best protected part of the bone.

In Bruns's[1] list of 100 epiphyseal separations, but one is recorded at this situation. This occurred in a girl, fourteen years of age, who was run over by a heavy carriage; the muscles about the joint were reduced to a pulp, the pelvic bones were fractured, and death followed soon after.[2]

Nor does the physical examination of the patients here recorded make such a diagnosis probable or possible even.

In all the shortening of the limb was from half an inch to an inch, and yet the movements of the joint within the unrestricted range of motion were free and regular, and in all the union of the fragments was firm. If, however, this upward displacement of the trochanter had been the result of a separation of the epiphysis, which forms the greater part of the articulating surface, the great irregularity within the joint, at the point of union, would have caused restriction of motion to a much greater degree than was present in any one of these patients.

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[1] Archiv für klinische Chirurgie, Vol. XXVII, p. 241.

[2] Bousueau, Bulletin de la Société anatomique de Paris, April, 1867, p. 283.

Epiphyseal separation at the hip-joint as the result of acute suppurative disease is not at all uncommon in early childhood, the resulting upward dislocation being often mistaken at a later period for congenital misplacement of the femur, and it is such a result that would almost inevitably follow a traumatic separation to the extent indicated by three-fourths of an inch of shortening of the leg. (Figs. 1, 2, 3, and 4.)

As these patients were not seen by me at the time of the accident, I cannot report upon the relative results of treatment. Indeed, it is very doubtful if better immediate results could have been obtained by the usual procedures than those which followed no treatment.

It would appear that there is practically no danger of non-union, and, as has been stated, it is probable that the fragments are not separated. In some instances in which the shortening is slight and the trochanter not prominent there is probably a true impaction, in others the neck of the bone is simply depressed downward and backward. It is upon this change that the immediate shortening and the danger of future disability depend, and on this account the advisability of breaking up a partial impaction when elevation and prominence of the trochanter are present should be considered.

This might best be accomplished by abducting the leg to its full limit, thus by leverage of the rim of the acetabulum and by downward pressure on the trochanter with extension of the limb one might hope to rectify the deformity, at least in part.

If this were possible, a plaster bandage, extending from the axilla to the toes applied under extension in the abducted attitude, might secure union in this selected position. If the fragments were actually separated, a long Thomas hip-splint so modified as to allow for direct traction and countertraction by means of a perineal band and leg straps might be used with advantage. At the stage of repair in which I have seen these patients the indications for treatment were very simple, since it was evi-

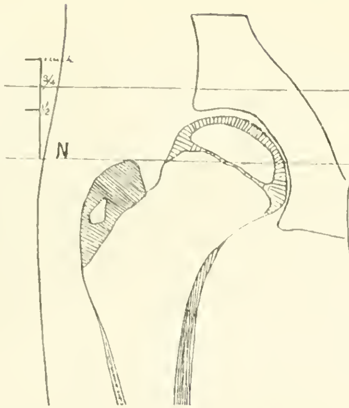

Fig. 1.—The upper extremity of the femur, exact size at the age of five years, drawn from a specimen in the Museum of the Hospital for Ruptured and Crippled, showing the epiphysis of the head and trochanter and the relation of the trochanter to Nélaton's line, N.

The shaded area in the head and trochanter represents the cartilages.

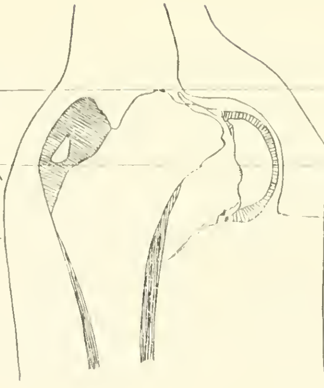

Fig. 2.—A scheme to illustrate epiphyseal disjunction, showing the separation of fragments necessary to account for upward displacement of the trochanter to the extent of three-fourths of an inch, as in the cases reported.

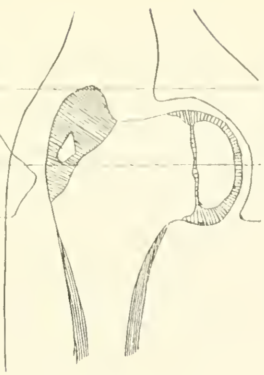

Fig. 3.—A scheme to illustrate fracture and depression of the neck of the femur and consequent elevation of the trochanter, also the limitation of the range of abduction of the limb that must result.

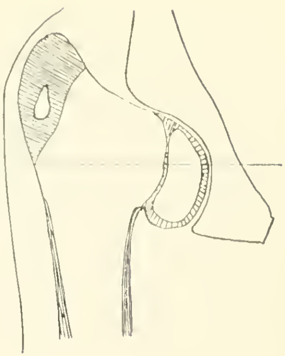

Fig. 4.—A scheme to illustrate further depression of the neck and its effect in causing permanent abduction of the thigh.

dent that the injured limb was incompetent to sustain the strain of use, and in those who remained under treatment the simple traction hip-splint, or one of its modified forms, was applied; this was worn for several months, and it at once relieved the symptoms. I again suggest that its more frequent use as a walking splint would shorten very decidedly the period of helplessness and discomfort after the similar injury of the adult. With it massage and passive motion, particularly in the direction of abduction, should be employed to guard against the permanent adduction of the limb, a deformity that sometimes follows fracture due, doubtless, in part to the improper use of the leg during the prolonged weakness of convalescence.

As to the remote results of the accident, the great danger to be apprehended is the increased shortening and disability, due to a further descent of the depressed neck of the femur, even though it may be deferred to the period of adolescence.

It is the normal upward inclination of the neck of the bone, to about 129 degrees in childhood, that protects it from strain. When it is depressed, as the result of violence or otherwise, to a right angle, the tendency to a further descent until the head of the bone rests upon the trochanter minor is very great.

This fact is emphasized by the history of Case I, now fifteen years of age. At the time of the injury and when treatment was discontinued the shortening was but three-fourths of an inch, and there was no disability. Two and a half years later the shortening was one inch with slight limitation of the range of abduction. At the present time (February 5, 1897), at the age of fifteen, he presents the typical appearances of extreme coxa vara. (See Figs. 5 and 6.)

There are atrophy of the limb and eversion of the foot, two and a quarter inches of actual shortening, which is increased to two and three-fourths inches by the permanent adduction of the thigh. The patient walks on the toes of the short leg with a marked limp. The shortening is not the result of interference with the growth of the limb, since the distance from the trochanters to the malleoli is equal on the two sides; it is due to the depression of the neck of the bone and to the corresponding elevation of the shaft on the pelvis.

The condition of patient No. I is duplicated by that of No. IV, who has also reached adolescence. He was examined February 18, 1897, four years after treatment had been discontinued. There is now an actual shortening of two inches, increased to two and a half inches by a permanent adduction of the thigh. The other signs are so similar to those of the preceding case that it is unnecessary to enumerate them. In this case there are at times symptoms of discomfort about the joint and thigh after long standing or exertion, similar to those of the ordinary coxa vara.[1]

The same increase of deformity is illustrated by the present condition of Case V. This child, at the age of two and a half years, sustained a fracture with shortening of three-fourths of an inch. One year later there was no disability and no increase of the shortening. Now, at the age of seven years, the shortening has increased to one and a quarter inches, there is well-marked restriction of abduction, and it is evident that there has been a gradual depression of the neck during the three and a half years since the last examination. (See Figs. 7 and 8.)

The skiagram of one of the more recent patients (Case VIII) shows the position of the neck after fracture and the strain to which it must be subjected, a strain that must almost inevitably lead to greater depression.[2]

It is this danger of future, if long-deferred, deformity as the result of this fracture in childhood that has led me to advise what would hardly be indicated at a later period of life, the attempt to rectify the deformity by forcible manipulation.

The histories of the cases here presented would seem to show that final disability does not depend upon simple injury to the bone at the time of the accident or upon a subsequent loss

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[1] Whitman, "Observations on Bending of the Neck of the Femur in Adolescence," etc., New York Medical Journal, June 23, 1894.

[2] Of the remaining cases, one has been under observation but a short time (Case X). Two were not again seen after the original treatment or examination (Cases III and VII). In Case II the shortening increased a half inch in one year; Case VI a quarter of an inch in two and a half years; Case VIII a quarter of an inch in fifteen months. In but one case (Case IX), examined fifteen months later, had there been no increase in the shortening.

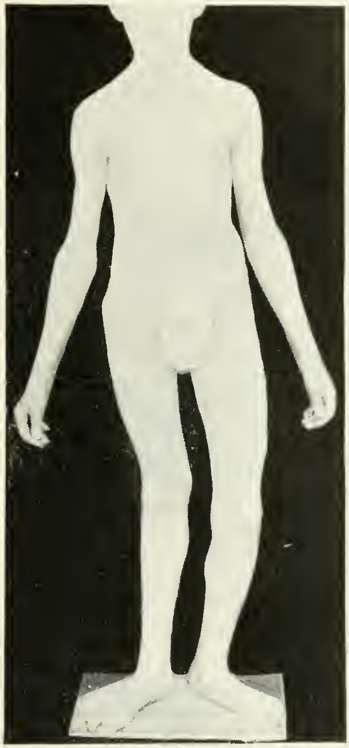

FIG. 5.—Photograph of patient No. 1, illustrating a remote result after fracture,—atrophy, adduction, eversion, and shortening; also a secondary knock-knee.

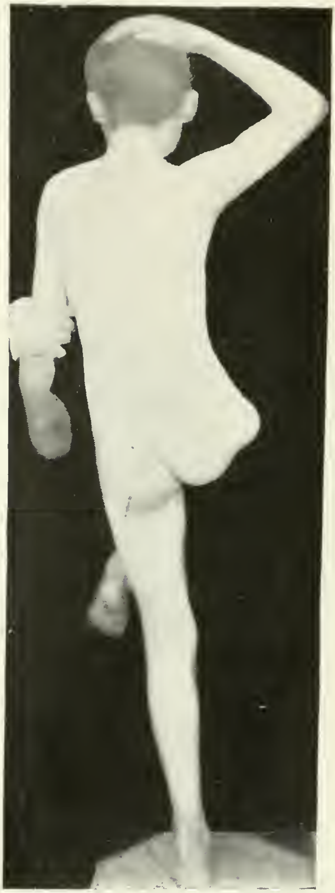

FIG. 6.—Patient No. 1, showing the great projection and elevation of the trochanter made more apparent by flexing the leg.

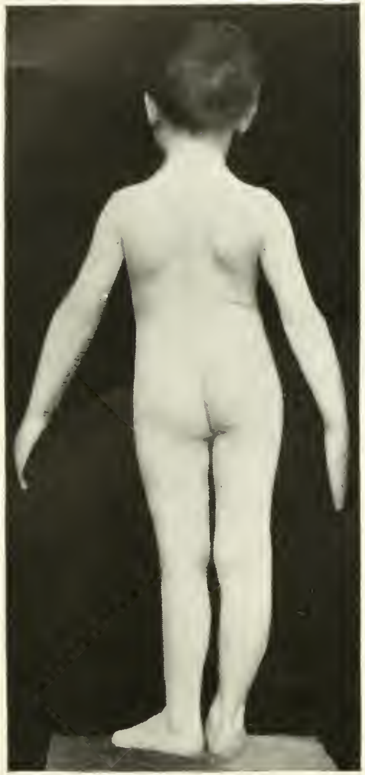

FIG. 7.—Photograph of patient No. 5, four years after the accident, showing the shortening and eversion of the leg. The relative size of Bryant's triangles is shown in the background. *Vide* Skiagram No. 1.

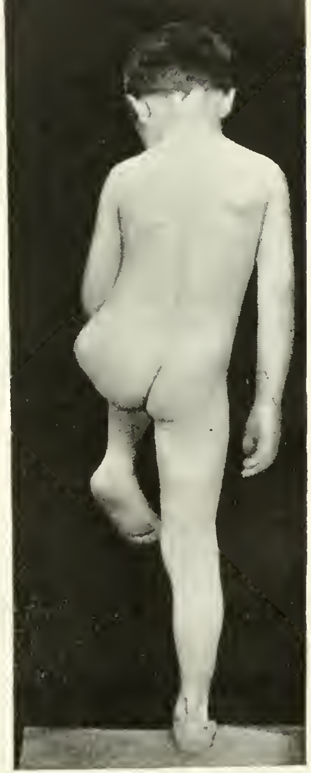

FIG. 8.—Rear view of the same patient (No. 5), showing the prominence of the trochanter on flexing the leg, as in patient No. 1.

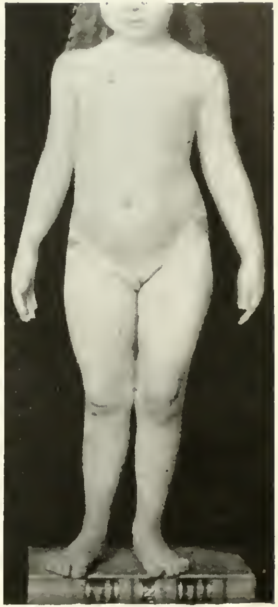

FIG. 9.—Photograph of patient No. 8, illustrating the tilting of the pelvis toward the short leg. The relative size of Bryant's triangles is shown in the background.

of growth. It is due solely to the distortion of the neck of the femur and to the interference with the function of the limb that this depression entails.

The determining causes of the deformity and ultimate disability are,—

(1) The direct result of the injury. This might be remedied, in part at least, by the treatment suggested if the patient were seen at the time of the accident.

(2) The further depression due to the early use of the limb during the stages of repair. This might be prevented by the application of a hip-splint or perineal crutch, which should be worn for at least six months, or until complete consolidation had taken place. The support should be combined with daily massage and forcible manipulation of the limb in the direction opposed to its limitation, that is in abduction, to prevent secondary contraction of the muscles, which increase the disability.

(3) The later sinking of the neck, due simply to the strain to which it is exposed by the deformity. This may be prevented, if at all, only by the supervision of the patient, who must avoid violent exercise, and particularly long standing or laborious occupation. It is evident, also, that a guarded prognosis as to the final outcome of the injury should be made when treatment is begun. The treatment of the final disability should be similar to that of the ordinary form of coxa vara,—that is, by a division of the neck of the bone or by a subtrochanteric osteotomy,—although the duration of the deformity and its causes is likely to make the result of the operation much less favorable than in the latter instance. It should be remembered that in childhood a shortening of even half an inch will cause tilting of the pelvis, so that a higher heel should be worn to prevent a compensatory deviation of the spine.

In conclusion, it may be stated that the principal object of this paper is to demonstrate again that the traditional age-limit for fracture of the neck of the femur, that may have led to inaccuracy of teaching and to errors in diagnosis, does not exist.

The evidence presented would seem to prove that the fracture not only does occur in childhood, but that it is probably not an uncommon accident. It may be unrecognized, or it may, at a later period, be mistaken for and treated on the diagnosis of hip-disease.

Separation of the epiphysis of the head of the bone is doubtless a possibility, but we must conclude, in opposition to the accepted teaching, that it would be rather extreme violence followed by non-union of fragments or subsequent disability that would favor this diagnosis, while the less the violence and the less the immediate disability the greater the probability of fracture, when signs of fracture are present, because a bone is more likely to break in its weakest than in its strongest part, and because rapid repair and almost normal functional ability, while upward displacement of the trochanter remains as in the cases here reported, shows that the break could not have involved the articulating surface of the joint.

Finally, attention is again called to the peculiarity of this fracture in childhood, that although the immediate results are extremely favorable without treatment, yet the final outcome is likely to be a disability even more noticeable than after fracture in adult life.

THE TREATMENT OF GENERAL SEPTIC PERITONITIS.[1]

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THE object of this paper is not to give an account of the various methods which have been employed in the treatment of septic peritonitis, neither is it to dwell on the results of treatment as recorded in the statistics of different surgeons, but simply to state the conclusions which have been derived from my own experience in the treatment of these cases. My remarks will apply solely to that form commonly known as diffuse or general septic or suppurative peritonitis, where the infection, unlimited by adhesions, has extended to all parts of the peritoneal cavity. Intraperitoneal collections of pus, if walled in by adhesions, no matter how numerous or how extensive they may be, are not considered, neither are cases of tubercular peritonitis.

It is useless to discuss the medical treatment of this disease except, perhaps, to condemn in the strongest terms the inexcusable delay which is sometimes practised before the patient is handed over to the surgeon. Such delay will generally deprive the patient of the slight chance which may exist for recovery.

A connection for the past nine years with a public hospital, whose ambulance service covers a large territory, has given me the opportunity to observe many cases of general septic peritonitis. Most of these patients have been, on admission to the hospital, in a very critical shape, and a considerable number have been moribund and beyond all hope of recovery. Between the years 1888 and 1895, inclusive, I have operated in forty-three cases of general septic peritonitis. Of these thirty-seven have died and six have recovered, a mortality rate of about 86 per cent. It is, perhaps, true that at the present time some of these cases would not be subjected to operation on account of their hopeless character, but prior to 1890 the limits of laparotomy for the cure of this condition were not as clearly defined as they are at present. I will not weary you with the history of these cases, but will merely state that many different operative procedures have been employed. A free abdominal incision was made in all, and with a few exceptions irrigation was employed. It was omitted in a few cases where death on the operating-table seemed imminent, and any further procedure, beyond the introduction of a large, glass drainage-tube, was unjustifiable. Various irrigating fluids have been employed, solutions of bichloride of mercury, carbolic acid of different strengths, and of boric acid, Thiersch's solution, peroxide of hydrogen, and sterile water. In some cases the intestines were removed from the abdominal cavity for more thorough cleansing, in others, this was considered inadvisable. In a few cases the intestine was opened by a small incision to allow of the escape of gas and fæces in order to facilitate the return of the coils into the abdominal cavity. It was noted that such an incision did not relieve the distention for a distance of more than ten or twelve inches.

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[1] Read before the New York Surgical Society, March 24, 1897.

Various methods of drainage have been employed, a large, glass tube passing down into the pelvis, several rubber tubes passing in various directions, in a few cases leading out at counter-openings in the loins, strips of gauze, and various combinations of these methods.

As a rule, if a fibrinous deposit was found on the intestinal walls as much of it as possible was removed. I do not feel convinced of the wisdom of this procedure, and am in doubt as to which is the most judicious, to expose a raw surface for the absorption of sepsis or to shut up among the intestinal coils septic masses which may later break down into abscesses?

I will briefly mention two cases which serve to illustrate some of the methods employed.

Female, aged nineteen years; on March 14, 1889, she was seized with severe abdominal pain which increased until March 20, when she was brought to the hospital by ambulance. Bowels, in spite of cathartics, had not moved since the 17th; abdomen tremendously distended and tympanitic; constant vomiting; temperature (rectal) 97° F.; pulse 136. Fluctuating tumor in right iliac fossa; chloroform; laparotomy, median incision five inches long. On opening peritoneum purulent serum gushed out. This fluid permeated all parts of the peritoneal cavity and scattered through it were flakes of lymph. No adhesions found except around the right Fallopian tube, which was distended to the size of a cocoa-nut, and in its wall was an opening through which fetid pus was escaping into the general peritoneal cavity. The distended intestines were partially removed, the abdominal cavity thoroughly irrigated with gallons of hot, sterile water, and a large, glass drainage-tube inserted into the pelvis. The patient needed stimulation during the operation and was nearly pulseless at its close. She rallied and was out of bed on April 26, and discharged, cured, on May 6.

Male, aged twenty-seven years; gave a history of subacute appendicitis for several weeks before admission to the hospital, on April 23, 1890. Twenty-four hours before admission he was seized with sudden severe pain, vomiting, and signs of collapse. Vomiting and hiccough had been constant. On admission abdomen much distended and tympanitic; skin cold and clammy; temperature (rectal) 98° F.; pulse 120. There was a right inguinal hernia, very tense; chloroform; incision over hernial sac which contained a loop of intestine, purplish in color, almost gangrenous. Peritoneal cavity contained several pints of purulent serum; incision enlarged upward and the intestines congested, distended, and covered in spots with layers of fibrin were removed from the abdominal cavity and wrapped in hot towels. Appendix found to be partially gangrenous, and it apparently was the source of the general septic infection. Intestines and peritoneal cavity were thoroughly irrigated with hot, sterile water. As the intestines could not be returned, an incision was made into the ileum and a quart or more of fluid fæces and much gas escaped. This opening was closed by Lembert sutures and the intestines replaced. Abdominal wall sutured except where it admitted a large, rubber drainage-tube eight inches long, which was directed towards the left loin where a counter-opening was made and a similar tube inserted. Severe collapse followed, but he rallied under stimulation. During the first day irrigation of hot water through the anterior tube was employed at intervals of two hours. At each irrigation several quarts were used and the abdominal cavity distended till respiration was affected. It caused considerable distress and some shock, and after the expiration of twenty-four hours it was discontinued with the exception of two irrigations administered on the second day. On April 29, five days later, his general condition was fairly good. No vomiting, bowels had moved freely, temperature 100.5° F.; pulse, 120. There was gradual improvement until May 5; on May 6 the heart's action became weak and the temperature rose, and on May 8 he died (fifteen days after operation). At the autopsy several small abscesses were found between the intestinal coils, the largest being the size of a walnut. Cause of death, sepsis. It is possible that the patient's life might have been saved had the abdomen been reopened and irrigated on the twelfth day, when he began to show signs of sepsis.

The question as to the respective advantages and disadvantages of opium and of cathartics in the treatment of those cases is as yet unsettled, and discussion on this subject seems endless.

I must confess that I have been surprised that in certain recent articles the administration of opium is preferred to the use of catharsis, as, for example, in the excellent article on peritonitis in the recent volume of the "Twentieth Century Practice," the author favors the use of opium. My own experience is exactly opposed to this view. I feel that the safety of these patients depends in a large measure on our ability to restore to the paralyzed intestines their peristaltic action, thus increasing intestinal drainage and diminishing the danger of emigration of colon bacilli through the walls of the intestine. Of course, in certain hopeless cases or for the relief of very acute pain opium should be administered, but I am entirely opposed to its employment as a routine measure of treatment; indeed, I am apt to feel that every hypodermic which a patient receives diminishes his chance for recovery.

I feel that the hopelessness of these cases is often due to inability to retain cathartics when administered by the mouth on account of incessant vomiting. Their administration by rectum, as, for example, sulphate of magnesia, seems to me almost valueless.

For these reasons I began, some years ago, to employ the intraintestinal injection of sulphate of magnesia and of other cathartics. At first I was doubtful of the beneficial results of this plan of treatment, and it is only within the past eighteen months that I have been convinced of the great value of this procedure, which I now employ in almost all my operations on cases of general septic peritonitis.

Since the adoption of this procedure as a routine measure the results of operation have been so much more favorable than those of former years that I cannot but believe that, in a measure at least, this improvement is due to the injection into the small intestine of a saline cathartic. It is true that in other respects, especially in the cleansing of the peritoneal cavity, the treatment may have been more thorough and systematic, but not sufficiently so, I think, to have produced such a difference in the results. More than once, within the past year, I have been astonished to observe cases which, judging from former experience, I considered almost hopeless, begin to improve before twenty-four hours had elapsed, flatus being expelled and a movement of the bowels following soon afterwards. Former experience led me to expect in these cases, where the distention was very great and the vomiting constant, that intestinal paralysis would continue; that vomiting would persist; that constipation would be absolute, and that death would result on the second or third day. During the past year such an outcome has been exceptional, as shown in the records of my operations from January 1, 1896, to March, 1897, during which time I have operated at the Presbyterian Hospital on eight cases of general septic peritonitis, one of these died as the direct result of the peritonitis, one died from lung complications five weeks after operation, five recovered and have remained well, and one is still in the hospital convalescing, and will probably recover (fifty days since operation).

This record is so much better than that of former years that one naturally endeavors to ascertain the reason for this improvement. Is it due to the coincidence that many favorable cases have been encountered, or is it due to the treatment employed? It may be that the patients have been of unusual vigor, or have been brought to the hospital at an earlier stage of the disease, or that the poison has been less virulent in character, and while I am willing to grant all this, yet, on looking over the histories of these patients, their average condition at the time of operation does not seem to have been less severe than that of those encountered in former years. With two exceptions, every case that has been brought into my service has been subjected to operation. Each of these two was moribund on admission, one dying within an hour and the other being unable to bear an anæsthetic. With two exceptions (Cases III and V) the condition of all the other patients seemed desperate, but laparotomy was performed as offering the one chance for recovery. The condition of three (Cases I, VI, and VIII) was such that the prognosis at the time of operation seemed absolutely bad, and I do not think that any of the spectators, who saw the interior of the peritoneal cavity, had any idea that recovery was possible. In six of these patients the cause of the peritonitis was a gangrenous appendix, in one a perforating gastric ulcer, and in one a septic uterus. In two cases streptococci were found in cultures and in two colon bacilli. While granting an element of chance in encountering so many favorable cases almost in succession, yet I feel convinced that these results are due in large measure to more thorough and systematic treatment, and I am inclined to attribute a large share of this success to the intestinal injection of sulphate of magnesia.

CASE I.—Cause, appendicitis. W. P., male; aged forty-four years; admitted January 20, 1896, at 4 P.M. For three days abdominal pain; for two days vomiting almost constant; last movement of bowels on January 16. On admission temperature 101° F.; pulse 150; respiration 50; great abdominal distention; vomiting almost constant. Operation at 9 P.M. Chloroform; median incision; large amount of purulent serum in general peritoneal cavity; much fibrin on intestines; no adhesions; appendix gangrenous, removed; irrigation; drainage, by glass tube and gauze strips; wound partly closed. Died January 21.

Case II.—Cause, ovarian abscess. M. W., aged thirty-two years; admitted June 24. History of pelvic inflammation for past two months. Insertion of uterine sound and intrauterine medication forty-eight hours before admission, followed by signs of shock and severe pain; abdomen distended and tender; muscular rigidity; vomiting constant; pulse 112; temperature 99° F. (rectal). Chloroform; median laparotomy. A pint or more of thin brownish purulent serum in general peritoneal cavity; no adhesions except around ovaries and tubes; small abscess in left side of pelvis opened and several small abscesses found in left ovary; evidence of rupture of an abscess in neighborhood of right broad ligament and an abscess in right ovary; intestines removed, irrigated, and replaced; injection of one ounce of sulphate of magnesia; drainage by gauze strips and glass tube in pelvis; wound partially closed; calomel; bowels moved in twenty-six hours. Discharged cured August 2.

Case III.—Due to appendicitis. C. L., male, aged nineteen years; admitted October 18. History of fourteen previous attacks. Thirty-six hours before admission sudden and severe abdominal pain, great tenderness, and vomiting. On admission, temperature 100.2° F.; pulse 110; abdomen flat and intensely rigid. Operation at 10 p.m. Chloroform; right lateral incision; general peritoneal cavity filled with turbid serum of thin consistency; no adhesions; appendix gangrenous; irrigation with salt solution, intestines being removed; injection of one ounce of sulphate of magnesia; drainage by gauze strips; wound partially closed; ten grains of calomel; first movement of bowels in twenty hours. Discharged cured in six weeks.

Case IV.—Due to perforating gastric ulcer. A. B., female, aged twenty-one years; admitted November 8 at 5 p.m. Epigastric pain and occasional vomiting since October 28. On November 7 severe abdominal pain and tenderness with signs of collapse. On admission, temperature 103.5° F.; pulse 125; respiration 36; abdomen moderately distended, very tender, muscles rigid; heart displaced; general bronchitis (pneumonia?). Operation 8 p.m. Chloroform; localized abscess between stomach and liver; below stomach general peritoneal cavity containing thin pus; no adhesions; no fibrin; intestines injected and distended; opening in stomach sutured; irrigation salt solution; gauze drainage. For ten days slow improvement. Bowels moved freely at end of twenty-four hours. From November 20 to December 15 signs of sepsis; abscess of spleen opened; empyema and pneumonia. Death thirty-eight days after operation.

Case V.—Due to appendicitis. J. C., male, aged ten years; admitted November 14. Thirty hours previous to admission sudden severe abdominal pain and vomiting, which continued; constipation. On admission, temperature 102° F.; pulse 110; moderate abdominal distention and tenderness, acute over appendix; rigidity marked. Operation 10 P.M. Chloroform; lateral incision; peritoneal cavity contained about a quart of thin, dirty-looking pus; no adhesions; few flakes of lymph; appendix gangrenous; irrigation salt solution; injection of one ounce of sulphate of magnesia; drainage by four strips of gauze; wound not sutured; five grains of calomel; bowels moved at end of twenty-four hours; rapid convalescence; secondary suture. Discharged cured December 12.

Case VI.—Due to appendicitis. M. M., female, aged twenty-six years; admitted November 10 at 4 P.M. Twenty hours previous abdominal pain and vomiting. On admission, temperature 101.8° F.; pulse 126; respiration 34; moderate abdominal distention and general tenderness; constant hiccough and vomiting. Operation at 5 P.M. Chloroform; median incision; a quart or more of free pus in general peritoneal cavity; appendix adherent, gangrenous; intestines distended injected; some flakes of lymph; no adhesions; intestines removed; irrigation, salt solution; injection, one ounce of sulphate of magnesia; silk drainage; wound partially closed; calomel; bowels moved at end of thirty hours; slow convalescence. Discharged cured December 23.

Case VII.—Due to appendicitis. L. H., female, aged thirty years; admitted January 10, 1897, at 1 P.M. History of pain over appendix for eighteen months. Twenty-four hours before admission severe pain and tenderness; vomiting and fever. On admission, temperature 102° F.; pulse 115; moderate distention and tenderness, but marked over appendix. Operation at 4 P.M. Chloroform; lateral incision; peritoneal cavity contained a quart or more of thin, brownish pus; no fibrin; no adhesions; intestines injected and distended; appendix gangrenous, not adherent; intestines removed; irrigation, salt solution; injection, one and a half ounces of sulphate of magnesia; wound partially closed; calomel; flatus expelled at end of twenty-four hours; bowels moved at end of forty-eight hours; casts and albumen in urine; slow convalescence. Discharged cured February 22.

Case VIII.—Due to appendicitis. F. S., female, aged twenty years; admitted February 9, 1897, at 2 P.M. One previous attack; on February 3 abdominal pain and vomited; pain, vomiting, and tenderness continued; no food retained. On admission, condition desperate; temperature 100° F.; pulse 130; marked distention and tenderness; vomiting constant. Operation at 5 P.M. Chloroform; median incision; peritoneal cavity contained several quarts of very fetid, thick pus; much fibrin; appendix gangrenous; intestines removed; irrigation; injection of one and a half ounces of sulphate of magnesia; drainage with strips of silk; wound partially approximated; calomel; three movements of bowels on second day. On fifth day three openings in small intestine appeared through which all intestinal contents passed till March 20, when two are closed and fæces passing by rectum. Abscess of parotid opened; gradual improvement.

While the details of operation must necessarily vary somewhat according to the conditions found in each case, the plan of treatment employed was in general as follows:

(1) Chloroform is employed as the anæsthetic.

(2) A free incision is made generally five or six inches in length. Its situation varies according to the organ which has excited the peritonitis. The purulent fluid is allowed to flow out, its escape being often aided by turning the patient on the side.

(3) As a rule, the intestines are allowed to escape from the abdominal cavity into hot towels held in the hands of assistants (the patient generally being turned on the side). In certain cases, where the distention is enormous and where the heart's action is very weak, any considerable escape of the intestinal coils is prevented. Where possible, however, even at a great risk, the intestines are removed, and if well protected by hot towels I have not found that this evisceration increases to any great extent the shock of the operation. If the distention is such that their return is impossible, I do not hesitate to open the ileum and allow gas and fæces to escape. These openings are closed by Lembert sutures. I have never seen any reason for establishing a temporary artificial anus by suturing the gut to the abdominal wall as has been recommended.

(4) The cause of the peritonitis is removed. If it be an

appendix or tumor, it is extirpated; if it be a perforation, it is sutured.

(5) The intestines and the cavity of the peritoneum are thoroughly irrigated with hot, normal salt solution. If the intestines have been removed, they are thoroughly but gently washed with the contents of several two-litre flasks, as is also the abdominal cavity, at the same time a stream from a three-gallon irrigating jar is steadily flowing into every corner and crevice of the cavity through the soft rubber tube which is moved about in different directions. The temperature of the solution is 110° to 112° F. If the removal of the intestines has been considered unwise the edges of the incision in the abdominal wall are grasped by the assistant, held well up and separated to their full extent, and the cavity flooded by flaskful after flaskful of the solution at the same time that the irrigating tube is pouring a steady stream into all pouches and recesses opened up by the hands of the operator, which are gently moved about among the intestinal coils. I have not found that much shock is caused by irrigation carried out in this manner, indeed, on the contrary, the heart's action will often be stimulated by the hot water. It is of the utmost importance that the temperature of the water should not be below 110° F., indeed 112° F. or even 114° F. is probably safer. Irrigation is preferred to the swabbing of the intestines and peritoneum by means of gauze pads or sponges. I doubt if the cleansing by this latter method is as effectual, and it seems reasonable to suppose that the mechanical friction must damage to a certain extent the peritoneal endothelium and so diminish the vitality of this serous coat and its power of resistance against infection. Of course, I do not mean to claim that perfect cleansing can be accomplished by any method. A considerable amount of the salt solution is allowed to remain in the abdominal cavity for the purpose both of stimulating the heart and of favoring intestinal drainage.

(6) Sulphate of magnesia is injected, through a hollow needle attached to a large aspirating syringe, into the small intestine, a point in the jejunum or in the ileum, as high up as possible being selected. A saturated solution containing between

one and two ounces of the salt is used. The needle puncture is closed by a Lembert suture.

(7) The peritoneal cavity is drained generally by four or more strips of sterile gauze thrust in different directions among the intestines. At times a large glass tube is also inserted into the pelvis. In other cases strips of rubber tissue are used, and recently I have employed strips of pure silk sponges instead of gauze. These appear to drain well and are easily removed, but are not so well suited for walling off septic areas from the general peritoneal cavity. The strips of rubber tissue are most easily removed of all, but I do not feel sure that their drainage is as efficient. Each gauze strip is often surrounded for two or three inches at its point of exit by a cuff of rubber tissue which facilitates its removal.

(8) The abdominal wound is but partially closed by sutures. The edges are not closely approximated but are generally partially drawn together by two or three silkworm-gut sutures between which and the intestines is placed a compress of gauze. A wound which gaps somewhat affords freer exit for the escape of the peritoneal secretions.

(9) After the return of the patient to bed, if the condition of the stomach will permit, a ten-grain dose of calomel is given. If chloroform has been used this will generally be retained.

Rectal stimulation is employed during the first twenty-four or thirty-six hours. If there be persistent vomiting lavage is sometimes useful.

In conclusion, I will again express the conviction that success in the treatment of septic peritonitis depends largely on thorough irrigation and restoration of intestinal peristalsis.

OPEN MEASURES IN THE TREATMENT OF SO-CALLED SIMPLE AND COMPOUND FRACTURES.[1]

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ALL conceivable fractures were formerly divided into two general classes,—viz., simple and compound. If the skin were not broken—or if broken the wound did not communicate with the seat of fracture—the injury was denominated a simple fracture, in contradistinction to all other fractures in which a wound in the skin communicated with the seat of fracture, and this class was called compound.

The treatment for the simple fracture was to approximate the fragments, immobilize them, control undue tendency to inflammation, and, finally, with repair, to re-establish the function of the limb.

The treatment of compound fractures was to immediately convert the compound into a simple fracture and proceed as with simple fractures. Should there be a protruding fragment which resisted all efforts at reduction saw it off and close the wound. Thus, in a few crisp, axiomatic sentences, the treatment of the whole range of fracture injuries was placed within the grasp of the student.

There are few who will read these lines that cannot verify their accuracy, and none who read them can instance a greater contrast in the treatment of any surgical affection than the treatment just rehearsed,—*i.e.*, the treatment of fractures in former times compared with their treatment to-day.

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[1] Read before the Philadelphia Academy of Surgery, October 5, 1896.

Let us take as an example a fracture of both bones of the leg. There is a small wound communicating with the seat of fracture, half or a quarter of an inch in length. The surgeon of to-day cleanses the skin and surrounding parts, isolates the field of operation, freely enlarges the wound in the skin, superficial and deep fascias, until he reaches the seat of fracture and can inspect as well as explore the region of injury. If there are fragments of bone he removes them, if they are likely to interfere with repair ; if there are bleeding vessels he secures them. Then, with the best possible exposure of the part, he washes it with pure or medicated water until he has cleansed it of all pollution ; and, finally, secures coaptation, not by the awkward and unsatisfactory medium of splints, but by direct coaptation by means of screws, wire, pegs, or some approximating material. Then, without even approximating the soft parts by sutures,—or if at all, but loosely,—the wound is dressed with sterile materials best adapted to absorb any exudation, and the whole enclosed in a plaster-of-Paris dressing and swung from a cradle, or placed upon a soft pillow.

Result, one dressing, and only one, from first to last, and with the removal of this, at the expiration of six to eight weeks, the wound has closed, the bones have united, and the patient well. No greater triumph for modern surgery !

Contrast such a case with the not infrequent result of a compound fracture of former days. Though the wound healed promptly, swelling soon began to extend from ankle to knee, pus dissected its way through all the parts until, finally, an opening was made either spontaneously or by the surgeon, and a pint of pus found exit. Then followed the long term of healing, the wasted muscles, necrosed bone with often, as a final result, the amputation of the limb as the best possible compromise. I am sure I voice the sentiment of modern surgeons when I say that more pus was seen in a single case of compound fracture a score of years ago than to-day one would see in a hundred consecutive cases of fractures treated by thorough open measures.

But right here I am met by the interrogatory, Does any one treat compound fractures to-day as they were treated a score of years ago? Is not the student everywhere taught to sterilize the wound and surrounding parts and dress it antiseptically? I answer yes; but what I claim is that he has learned but half a truth. He regards the wound as an infected wound, but he fails to realize that at the deepest part of that wound the parts surrounding the fragments of bone and periosteum his disinfectant cannot reach, and that with all his care in dressing he has done little more for the unfortunate man than was done in pre-Listerian days. What hospital surgeon cannot bear testimony to the accuracy of this statement. What surgeon has not been told on entering his wards that a case of compound fracture has been admitted, the wound syringed out with bichloride, sutured, and dressed antiseptically, and the whole immobilized; and all this is said with an air that betokens a full up-to-date appreciation of the proper thing to do? Some of these cases will do well, and the same is true of some compound fractures treated a score of years ago. But that this is not what I am describing as open surgery or bears no adequate comparison with it must be apparent to every reader.

Now let me take a similar injury to the leg, both bones broken, but the skin intact. What is the condition? It differs from the former in only one respect,—viz., it is not directly infected. In every other respect they are identical. The same laceration of periosteum, deep and superficial fasciæ, the same outpouring of blood between the fragments and muscles, the same displacement of bone fragments, and the question arises, How shall we proceed? I answer in precisely the same way as if the skin were broken. Open up the part with a free incision, carefully divide the deep fascia to the full extent of the seat of fracture, or, better, to the full extent of the external wound; then cleanse the wound of clots, ligate bleeding vessels, repair injured nerves, wire or directly immobilize the fragments, dress without suturing, and encase in plaster as before.

I must not be understood as saying that I would resort to open measures in all simple—*i.e.*, closed—fractures. Such an impression would be very foreign to my honest convictions as well as to sound surgical practice. What I would urge is that very many so-called simple fractures are as grave as the more dreaded compound fractures, and cannot possibly be scientifically treated by any than open measures. Open measures are often unnecessary, would often be injudicious, and yet I claim that they are the only measures that are entitled to the term scientific.

And this brings me naturally to the question, Should the terms *simple* and *compound* be retained in classification of fractures? In the light of modern surgery, when there is every rational ground for open measures, shall the term simple be retained?

I shall not adduce further arguments from a surgical standpoint but from a medico-legal; the term *simple* has a meaning to the patient, to a prosecuting attorney, and to a jury that may be foreign to the lecture-room. When a limb shrivels from a pierced nerve, or dangles like a flail from non-union, it reacts with overwhelming force against the attending medical officer. When it is said that he assured the patient, as he undertook the case, that it was only a simple fracture, the argument is that if it had been a simple fracture it would have healed, but through the ignorance of the doctor a very serious fracture had been mistaken for a simple fracture. Nor is such a charge chiefly to be preferred against the general practitioner. It can, with equal justice, be said of the hospital surgeon. Whoever treats a fracture with unbroken skin must confess that he has treated it ignorantly. I have seen six fractures of the elbow-joint, all *simple*, that resulted in total loss of function of the forearm and hand, and one of them occurred in the hands of one of Philadelphia's foremost hospital surgeons. Nor was there any sufficient evidence of the gravity of the original injury in any of the cases to create a suspicion on the part of the medical attendant of so serious a result. I have within two years had two cases of non-union of fracture occur in my own practice, both simple, both under my complete control,—the one a femur, the other a humerus. And when later I resorted to open measures I found the cause of non-union to be muscle interposed between the fragments, a condition that could not possibly be detected by palpation and manipulation at the time of setting the limbs, though both were set under the influence of an anæsthetic. I therefore repeat what I have said, that there is nothing simple about a fracture from a surgical stand-point, and, furthermore, as a definition it is both misleading and impolitic, and should be abandoned. I am very well aware that I cannot pose as a pioneer in this demand for a change of terms. Systematic writers and lecturers often employ less objectionable terms, and yet I do not think I hazard much in asserting that there will not be a medical student in the United States who will come up this year for his diploma, who will not find himself more familiar with the terms simple and compound than with any other terms descriptive of fractures. Systematic writers record other words with their pens, but in the hurry of debate or in the freedom of the amphitheatre, the memory brings forth to them the ever ready terms, simple and compound.

In the selection of substitute words, no one can tell what will become the most popular. The terms open and closed have been advocated; they are certainly easily spoken, easily remembered, familiar, and not open to the objection that they are misleading. To my mind, better terms, though less familiar, are *infected* and *non-infected.*

CASES OF ABDOMINAL CYSTIC TUMOR IN THE MALE.[1]

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I. Congenital Multilocular Cyst of the Omentum.

THE first case to which I wish to direct attention is, I think, one of extreme rarity,—a congenital, multilocular, omental cyst in the male. I have gone somewhat thoroughly into the literature of omental tumors and have been unable to find a single case of congenital fluid cyst of the omentum, unless, perhaps, the cases of Wells and Schwartzenberger were of this nature. I therefore regard my case as one of decided interest. Fluid cysts of the omentum, when not hydatid, are by no means common, but a few cases have been reported. Thornton [1] has reported two cases which were accidentally discovered during the performance of ovariotomies. One was a very small cyst located at the lower part of the omentum, and attached to it by a pedicle. It was a case in which both ovaries were involved in papillomatous cystic disease, and Thornton seems to think that the condition of the ovaries had something to do with the origin of the small, omental cyst. He states that he considers its origin to be that of cell infection. He describes it as a perfect, multilocular, ovarian cyst in miniature, but says nothing regarding the nature of its contents. The second one which Thornton describes was a larger and firmer growth. He describes it as being about the size of a small cocoa-nut, and having a thick, whitish wall with a puckered lining. The central cavity, which was small, contained three or four ounces of heavy, thick, yellowish fluid. The tumor was located high in the abdominal cavity under the edge of the liver, and was attached to the omentum by a heavy vascular pedicle. It was accidentally discovered during an operation for removal of a sarcomatous ovary. He seems to think that this tumor also bore some relation to the condition of the ovary.

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[1] Read before the Philadelphia Academy of Surgery, October 5, 1896.

Doran[2] has reported a case in which a cyst of ovarian origin was attached to the omentum. It would seem probable that a condition of this kind would be the result of inflammatory adhesions, an elongated omentum coming in contact with the diseased ovary. Of course, in a case of this kind the involvement of the omentum was the merest accident.

A truer type of omental cyst is found in a case reported in the *Lancet* (February 12, 1887), by Dr. Gooding. This surgeon removed a cystic tumor about the size of a fœtal head from between the folds of the great omentum. The tumor had been four years in development and had become very troublesome to the patient. It was successfully enucleated by a tedious process of dissection and was found to have no pedicle attachment, but to be simply embedded in the omental folds above the transverse colon. It contained a clear fluid and was not hydatid. Dr. Gooding thinks it might have originated from a blow.

A similar case, in a child four years old, is reported in the *British Medical Journal* for June 14, 1890. It was operated on by Spencer Wells. A cyst with thick walls and containing about a quart of fluid, found on examination to contain cholesterin, fat, and "compound granular *débris*," was reported by Dr. Buckley.[3]

Ormsby[4] removed from a woman of twenty-six years of age a multilocular cyst which was attached by a distinct pedicle to the omentum, and which weighed seventy-five pounds. The description given is very incomplete. J. Greig Smith briefly describes the removal of a cystic tumor, which he says was attached "only to the omentum," from a woman forty-four years of age. But further in his description he says that "near the insertion of the pedicle was a fleshy mass which was the enlarged fimbriated extremity of the Fallopian tube," and further says, "Not until the growth was examined after the operation was completed did I suspect that the cyst was really ovarian, the pedicle having been twisted through." He also stated that examination of the cyst contents showed it to be a mixed dermoid and glandular ovarian cyst. This would seem to disprove its being a true omental cyst, but rather like the one reported by Doran, an ovarian cyst which, through inflammatory adhesions, had become attached to the omentum secondarily.

Dennis[5] does not believe that dermoid cysts ever occur in the omentum primarily, or claims that at least such occurrence is "questionable." Smith refers to a number of cases of hydatid cyst of the omentum, but Schwartzenberger thinks such conditions are never primary, but are secondary to occurrence in the liver. The latter author reports a case of true lymph cyst in a girl four years of age. It was excised and the patient recovered. The cyst was multilocular. My own case was as follows:

B. H., boy, aged eight years. So far as at present concerns us, his family history is negative. His parents are both living and in good health. There are three other children in the family, all of whom are in good health. He has had no brothers or sisters die. His personal history shows that at birth the family physician noticed a marked distention of the abdomen,—sufficiently marked to cause some apprehension as to the cause and probable prognosis. However, at the age of six weeks this had largely disappeared, and was not particularly noticeable for the following six years, during which time the boy enjoyed good health. He was well-nourished and active and complained of no abdominal symptoms. But at the end of this time, which has now been two years, the abdomen again began to be distended so as to attract the attention of the family, and this distention had increased ever since, but with more marked rapidity for the last six weeks preceding the operation. At the time of examination his general nutrition did not seem to have been seriously interfered with and he ate and slept well. His greatest inconvenience was the weight of the abdomen and the fact that he had to void his urine every half hour or every hour, and in sleeping had to assume a semi-recumbent position that his respiration might not be interfered with. He walked with a firm and steady gait, but soon became weary, either on standing or walking, from the excessive weight of the abdomen. The distention of the abdomen was enormous on admission to the hospital, and fluctuation was distinct over the entire abdomen. The superficial veins of the abdomen were enlarged. The inferior portion of the chest wall was markedly distended. The lungs and heart were normal, except as to anatomical relations, having been pushed up by the tumor in the abdomen. The abdomen at its greatest point of distention measured forty-four inches in circumference. From the sternal notch to the pubes measured twenty-five inches. His body weight was ninety-three and a half pounds.

Examination of the urine gave the following results : turbid and pale in color ; acid in reaction ; specific gravity, 1.027 ; no albumen ; no sugar ; and no bile pigment.

It will be observed that, beyond the sense of weight in the abdomen and frequency of micturition, the symptoms were practically *nil.* With this condition of affairs a definite diagnosis was, of course, not made, but an omental cyst was suspected from the absence of symptoms relating to other organs. The extreme size of the tumor rendered such points as original location, movability, and shape indeterminate. His physician aspirated him twice, but secured but a small amount of fluid each time. This fluid he described as being of a dark-brownish color. The inability to draw off the fluid led to the belief that the tumor was multilocular, which assumption was shown in the operation to have been correct. Although ascites was not thought to be the cause of the abdominal distention, for the reason that there were no symptoms pointing to any lesion which would give rise to ascites, this condition was conclusively proven not to be present by the result of the aspirations. The most common source of fluid cysts of the abdominal cavity is diseases of the ovary, but this was at once excluded from the differential diagnosis by the sex of the patient.

After making this investigation into the history, and having subjected the patient to careful examination, I decided to operate by laparotomy, which was done June 27, 1896.

A free median incision was made below the umbilicus, and as soon as the peritoneum had been opened there was a hernia of a membrane presenting the same appearance as the peritoneum which had just been incised. An incision was made into this and was followed by a free flow of a dark, greenish-brown fluid. This flow lasted for but a short time and was followed by the presentation of a new portion of the cyst wall, which was also incised and allowed to drain. The definite diagnosis of a multilocular cyst was now made and the several compartments were drawn into the incision through the abdominal wall and incised, the parts being drawn out as they were emptied of their contents. This process was continued until a large number of sacs had been incised, and the whole cyst was sufficiently depleted of its contents to allow of its complete delivery through the incision in the abdominal wall; this delivery was accomplished and the attachment of the cyst was found to be the great omentum by its entire width, below the margin of the transverse colon, within the folds of which the cyst had developed. The entire omentum was ligated off in sections very close to the bowel on account of the proximity of the cyst to that viscus. The sac with some retained fluid was removed. The stump was perfectly dry and ascended into the upper part of the abdominal cavity. An iodoform gauze drain was introduced and the wound closed about it. During the operation the patient showed considerable evidence of shock, and disturbance of the circulatory and respiratory system which would be expected consequent upon the removal of such a degree of pressure. He, however, made a good recovery, under stimulation, from the shock and slept at short intervals during the night, the operation having been completed about 3 P.M. On the second day after the operation he was bright and happy and doing well. Part of the drainage was removed, and on the third day the remainder was taken out. On the ninth day the sutures were removed from the incision, the wound being practically closed by first intention. On July 11 he was weighed for the first time since the operation, his weight being forty-nine pounds. As this was two weeks after the operation and he had gained some in weight and strength, it is reasonable to believe that the cyst weight was not much less than fifty pounds, which was more than the patient's weight after its removal. His weight on July 25, four weeks after the operation, was fifty-four pounds; he was practically well and was discharged from the hospital. I have not seen or heard of him since, and for this reason have no doubt he is in good health. The contents of the cyst were carefully analyzed and found to be as follows: color, dark, yellowish-brown and turbid; specific gravity, 1.009; reaction, alkaline, slightly; no urea; albumen in large amount, sufficient to permit of inversion of the test-tube without spilling its contents after coagulation by heat. Microscopic examination showed the presence of large numbers of fat globules, cholesterin crystals, and unorganized granular deposit. The origin of the cyst is quite indefinite, but from the history of the case, was in all probability congenital, the process of development being, from some cause, held in abeyance during several years.

II. Bilocular Hydrocele.

My second case is one of *bilocular hydrocele.* This condition is not so rare as the one just described, yet is by no means of common occurrence. According to Morrow it was first described by Dupuytren under the name of *hydrocele en bissac;* but Dennis accords its first description to Lister,[6] as early as 1856.

G. B., aged twenty-one years, single, and by occupation a brakeman. His family history shows that his parents are both living and in good health. He has three brothers and three sisters, all of whom enjoy good health, except that one of his brothers also has congenital hydrocele. This brother is nine years of age. Heredity has, therefore, been claimed to be entirely without influence in chronic hydrocele, but this history, presenting as it does the occurrence of two cases in the same family, would, at least, suggest a further investigation into this element as an etiological factor in the affection. The patient's personal history shows that he has always enjoyed good health, except that he has been the subject of congenital hydrocele. This, however, gave him no pain and but little inconvenience until he was about fifteen years of age, which, it will be observed, was nine years ago. At this time the left side of the scrotum began to be more markedly distended, but still was the source of no symptoms except that after a hard day's work it would become painful. He had the scrotum tapped three years ago and the contents drawn off, but it soon refilled, and since then he has twice had it injected, once with tincture of iodine, and once with carbolic acid. Both of these operations were without permanent curative results. On admission to the hospital, May 19, 1896, he was subjected to careful examination with the following results:

The right side of the scrotum was normal. The left side was distended to about the size of a cocoa-nut and was pear-shaped, with the apex towards the external abdominal ring. The testicle occupied the posterior inferior part. The tumor was resistant to pressure while the patient was in the erect posture, but by continued pressure in the recumbent position it became flaccid and the skin no longer was tightly stretched, but became wrinkled and loose. But by having him resume the erect posture, the left scrotum after awhile again became distended as before, and on grasping the spermatic cord at the external abdominal ring and holding it firmly the tumor could not be reduced by pressure, when the recumbent posture had again been assumed. By partially retaining the grasp on the cord and pressing firmly on the distended scrotum a rippling thrill could be felt as the fluid rushed up through the inguinal canal. This, together with translucency and fluctuation, determined the swelling not to be due to hernia. The scrotal portion of the tumor would not refill while the patient remained in the recumbent position until the hands were pressed deep into the upper part of the pelvis, when the fluid would slowly be forced back down through the inguinal canal. Bearing down, on the part of the patient, also aided in refilling the scrotum. These circumstances led to the belief that the fluid did not escape into the abdominal cavity on recumbency of the patient, but into a second pouch which had been developed in the unobliterated vaginal process of the peritoneum which had remained after the descent of the testicle, but had become closed at its approach to the peritoneum, the sac having formed by distention of the vaginal process, between the peritoneum and the fascia transversalis by dissecting apart these two membranes. The point of origin of the hydrocele in these cases is thought by some to be in the scrotum, and to be extended to the unobliterated vaginal process of the peritoneum through the inguinal canal by blows or other force on the scrotum; but no such history could be obtained in this case, and I can see no reason why it might not have begun above and gradually dissected its way down to the scrotum through the inguinal canal by force of gravity. This point will be better appreciated when the origin of chronic hydrocele of any form is better understood. The condition of bilocular hydrocele is said to be more common in adults than in children, but this may be partly due to the slow process of formation,—not having yet attained a noticeable size in the child,—as was undoubtedly the case in this patient.

Examination of the urine made on entrance to the hospital was negative. I decided to operate by incision, which I did on May 20, 1896. The sac was incised at the junction of the middle and lower thirds of the tumor in the scrotum and a portion of it was dissected up and excised, after the contents had been evacuated. The cavity was now packed with iodoform gauze for drainage, the gauze being carried into the internal sac through the inguinal canal, and left in forty-eight hours. The wound was closed around the gauze-drainage. The patient reacted well from the operation and had but a slight post-operation rise of temperature. The wound was repacked and dressed daily for ten days, when the last suture was removed from the incision. On June 1 the wound was entirely closed and the patient was discharged. It will be observed that no irritants were employed in treating the sac after it had been relieved of its contents. In the ordinary case of hydrocele I do not consider such treatment of the sac necessary unless it is very much thickened, and even then removal of the sac is better. In the case just described such procedure would have been injudicious on account of the internal sac coming in contact, as it evidently did, with the peritoneum and the liability to peritonitis from irritation. It might be incidentally mentioned in this connection that it is remarkable to what extraordinary, and in many cases inconsistent, limitations this method of injection has been carried, as will be seen from the following array of drugs and other substances which have been employed for this purpose.

Here are some of the drugs thus employed: nitre, corrosive sublimate, alcohol, wine, tincture of iodine, solution of potassium iodide, of alum, of zinc sulphate, of copper sulphate, of silver nitrate; chloroform, carbolic acid, ergotin, cold water, milk, hydrocele fluid, and many others, even to atmospheric air. Certainly no more conclusive proof than this is necessary to show the inefficiency of any of them. In many cases very unfavorable effects have been produced.

The patient was heard from three months after the operation, to the effect that there had been no return of the hydrocele. Experience has taught me that the most satisfactory treatment for chronic hydrocele is simple incision and drainage.

REFERENCES.

[1] British Medical Journal, II, 1882, p. 1243.
[2] Obstetrical Transactions, XXIII, p. 165.
[3] British Medical Journal, May 16, 1885.
[4] British Medical Journal, Vol. I, 1883, p. 578.
[5] System of Surgery, Vol. III.
[6] Edinburgh Medical Journal, 1856.

A CASE OF PERSISTENT THYRO-GLOSSAL DUCT OR OF CONGENITAL LARYNGEAL DIVERTICULUM SUCCESSFULLY TREATED BY EXCISION.[1]

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THE patient, a young woman aged seventeen years, was brought to me for operation by Dr. W. J. Smathers, of Dubois. The family history of the patient showed no similar condition among her relatives. She had a small fistulous opening in the middle line of the neck on a level with the upper portion of the trachea.

The history furnished by Dr. Smathers was as follows: A week after she was born, the mother, while washing her, accidentally noticed a blue swelling on the front of the neck at the point where the fistula is now seen. When the child was sixteen days old, the swelling opened spontaneously and discharged some bloody material, which the mother describes as looking like liver. It is stated that two or three days before the discharge occurred the baby refused to nurse, choked a good deal, and lay with its head drawn back. After the swelling began to discharge the baby slept continuously for almost two days. About a week after the spontaneous opening, the fluid discharge became yellowish and pasty and continued of this character until the infant was three months old. The parents then thought that the trouble was going to be cured, but the little sinus remained patent and has never healed. They say that there was more discharge from the opening when the child caught cold, and especially marked was it when she had running from the nose.

For the last four years, the patient, who has now become a young girl, has been much annoyed by the discharge coming from the sinus and by the tenderness and soreness present there. Dr. Smathers made some futile attempts to get the opening to close by injecting it, and came to the conclusion that it opened in some manner into the air-passages. This opinion was held because air sometimes escaped from the sinus when she was swallowing, but no fluid food was ever observed to escape.

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[1] Read before the Philadelphia Academy of Surgery, November 2, 1896.

In March, 1895, upon the day when I first saw the patient, I etherized her and cut down upon the fistula. I found that the orifice opened into a tubular structure lying in the middle line of the neck. I dissected this tube from the surrounding tissues for an inch or more. It extended down in the direction of the thyroid gland; and I concluded to throw a ligature around the lower portion. After tying this ligature I cut the duct loose and dissected it out for a distance of about an inch upward. It then dipped inward as though it communicated with the larynx just above the cricoid cartilage. I did not prove that its calibre communicated through the crico-thyroid space with the interior of the larynx, but the structure was traced to the crico-thyroid membrane. A ligature was then tied around this upper extremity and the tubular structure, which was about as big as a quill, removed.

Although I had endeavored to keep the field of operation aseptic and to use aseptic materials, the ligatures caused suppuration. The wound healed promptly by first intention, but suppuration occurred, first at the upper end at the end of four weeks, and at the lower end after the lapse of six weeks. Dr. Smathers was obliged to remove both ligatures, after which the wound closed, and has remained healed.

The tubular structure removed was either a persistent thyroglossal duct or a congenital laryngeal diverticulum ending by rupture in a laryngeal fistule. The evidence is strongly in favor of the latter.

The thyro-glossal duct (sinus præcervicalis of His or canal of Rabl) usually atrophies and disappears about the eighth week of fœtal life. This canal connects the pharynx and the thyroid gland in the young fœtus. It begins at the point called the foramen cæcum in the base of the tongue of the developed animal, goes through the tongue's root, comes to the front of the neck below the hyoid bone and passes in front of the larynx to the thyroid gland. Kanthack[1] believes, however, that the foramen cæcum and the thyroid duct are independent of each other.

The thyroid gland is developed as a hollow organ from the front of the pharynx and descends in front of the trachea, leaving a narrow tubular neck extending upward through the developing tongue to the pharynx. The part which is to be the thyroid gland becomes solid and the duct to the pharynx atrophies and disappears, except in rare cases. When the second, or hyoid, branchial arch and the third and fourth branchial arches fail to coalesce properly, the meso-branchial space between them is not entirely obliterated and the thyro-glossal duct persists in whole or in part.

Sometimes the upper part of this tube remains patent and the foramen cæcum at the base of the tongue, which in the adult is a well-known point of topographical anatomy, leads into a pouch or diverticulum ending near the hyoid bone. At other times the duct persists farther downward and is found in the front of the neck as a tubular structure. The lower end of the tube may become distended and cause a swelling of a cystic character, which opens and discharges its contents. Then a sinus is pretty sure to remain. This opening differs from true branchial fistules of the neck, in that it is in the median line; while branchial fistules are near the margin of the sterno-mastoid muscle. Branchial fistules are, moreover, congenital, but fistules or sinuses of the thyro-glossal duct occur after birth from rupture of the thyro-glossal duct after distention with secretion. Secretion is furnished by the epithelial lining of the non-obliterated duct. Branchial fistules are also lined with epithelium identical with that found in the persistent thyro-glossal duct.

Dr. F. W. Higgins[2] has reported a cystic enlargement of such a persistent thyro-glossal duct, apparently due to throttling. The man, who was thirty-two years of age, had been seized by the throat in a scuffle eleven years previously. Shortly afterwards a soft and non-inflammatory swelling appeared in front of the larynx. Dr. Higgins dissected out the duct and cyst. It contained about two drachms of flocculent fluid looking like thin buttermilk. The pedicle, which was not permeable to a probe, had a diameter of about three-sixteenths of an inch, and, passing behind the base of the hyoid bone, became lost in the tongue.

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[1] Annual of the Universal Medical Sciences, 1892, v, G–9.

[2] Medical Record, March 16, 1895, p. 329.

A case of persistent thyroid duct is described in detail by J. Bland Sutton,[1] who was able to obtain the duct for microscopical examination before it had been damaged by attempts to cause obliteration of the discharging sinus. Its lumen was lined with columnar ciliated epithelium, and goblet cells were seen. The walls were made of tissue resembling atrophied thyroid tissue showing in various spots isolated acini lined with epithelium.

C. F. Marshall[2] found such a vestigial duct in a child upon whom he made an autopsy and gives much interesting information on the subject. The illustrations in his article and in that of Sutton are worthy of inspection.

In the case which I have reported, the duct apparently opened into the larynx. It is, of course, possible that air-bubbles, expelled at times during deglutition, were simply the air in the duct forced out by muscular contraction, and no evidence of communication with the air-passages. The termination of the tube at the crico-thyroid membrane was, however, demonstrated by the dissection. When I cut the tube off at its upper end there remained a dimple-like pit in the stump as though the tube continued beyond the point of ligation. The observation that small quantities of air at times escaped from the fistule is therefore credible.

It is unfortunate that the operation was done under circumstances which prevented me having the accessories that are found in hospitals; since then I would have felt more inclined to prove or disprove the supposed communication with the interior of the larynx and to establish the exact relation of the lower end of the tube. It continued in the direction of the thyroid gland, but I cannot state that it was connected with the gland.

[1] Lancet, November 9, 1895, p. 1161.

[2] Journal of Anatomy and Physiology, October, 1891; also in Annual of the Universal Medical Sciences, 1892, Vol. v, G–9.

The statement that the patient, when an infant, refused to nurse, choked a good deal, and lay with her head drawn back indicates that interference with respiration was a symptom of importance, until the bluish swelling on the front of the neck ruptured. This would lead one to believe that the condition was a congenital laryngeal pouch or diverticulum, though similar symptoms might have been produced by distention of a persistent thyro-glossal duct causing laryngeal or tracheal compression.

It is probable, I think, that the case was really one of laryngeal diverticulum due to imperfect union of the fourth pair of branchial arches.

Matas[1] says that congenital fistules of the neck were formerly believed to be due to imperfect closure of the four pairs of branchial clefts, but that recently this opinion has been modified in favor of attributing some of them to abnormalities in the coalescence of the wall of the sinus præcervicalis of His. This deep furrow at the base of the neck is found at the end of the branchial period, and is formed by the junction of the ectodermic surface of the branchial arches with the thoracic integument.

According to Matas, Lannelongue does not believe that this explanation is satisfactory in accounting for the complete fistules. These can, according to that authority, only be intelligibly explained on the theory of imperfect coalescence of branchial arches.

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[1] Medical News, December 2, 1893.

DOUBLE FRACTURE OF THE CLAVICLE FROM DIRECT VIOLENCE.

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THIS case is reported simply for its statistical value. While simple fractures of the clavicle are, with the exception of those of the lower third of the radius,[1] the most frequent that are met with, compound and multiple fractures are seldom seen unless the result of gunshot injuries, when they are apt to prove fatal from thoracic complications.[2]

The fractures in this case were not primarily compound, but became so on the second day after the injury, although due precautions were taken to prevent the sharp fragment from piercing the overlying integument.

E. F. P., aged twenty-four years, male, while riding a bicycle, was run down by a team of horses, and thrown violently to the ground. He received severe wounds of the face and neck during the fall. While on the ground one of the horses struck the right clavicle with his hoof. After being temporarily dressed, the patient was conveyed to his home, where I first saw him. Upon examination, the clavicle was found to be fractured at two points; a transverse break about an inch from the sternum, within the fibres of the rhomboid ligament, causing very little deformity; the other, an oblique fracture, beginning at the inferior border of the clavicle at about the junction of the middle and outer third, running obliquely upward, nearing the acromial end.

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[1] Modern Surgery, Roberts, 1890.

[2] Principles and Practice of Surgery, Ashhurst.

The outer end of the middle fragment was extremely sharp, and had already pierced all tissues overlying it with the exception of the skin, which, being badly contused, required but little to cause the fracture to become compound. This occurred the following day.

The patient was placed in bed, the arm kept in a Velpeau position, and a sand-bag applied to the shoulder, but neither the supine position nor the elevation of the shoulder was sufficient to overcome the defective muscular action, rendering it impossible to retain the proper relation of the middle fragment, which persisted in overriding. The question then arose whether or not wiring of the clavicle should be attempted. This procedure was deemed inadvisable, firstly, because of the contusion of the tissues which threatened to slough, and, secondly, because of the possibility of the union of the fractures, and the closure of the wound by granulation.

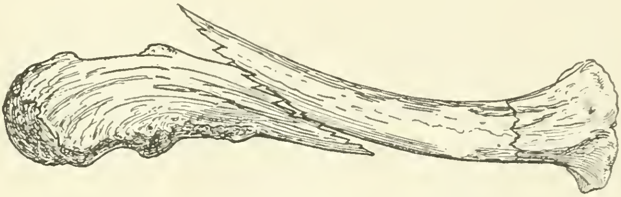

FIG. 1.—Double fracture of the clavicle.

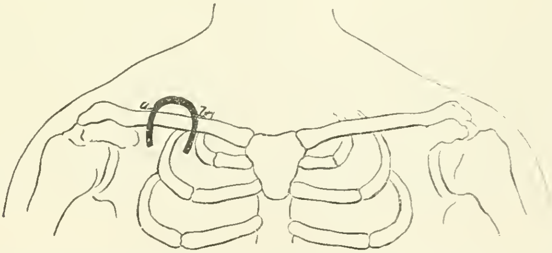

FIG. 2.—Showing impact of horse's shoe on the clavicle.

The patient was kept in bed for a week, but, on account of the intensely hot weather and the constrained position which caused much suffering, he was allowed to be about, and dressed as frequently as necessary. At the end of four weeks careful examination proved that there was complete union of the inner fracture with but partial of the outer.

The outer end of the middle fragment projected through an ulcer of the skin for about half an inch. Resection of the bone at this point was done a few days later, after which the arm was still retained in the Velpeau position for three weeks. He was then allowed to use it carefully, both fractures by this time having united solidly.

Three theories suggest themselves in explanation of the mechanism of this double fracture,—

(1) That the one at the outer end occurred first, it being struck by a portion of the horse's hoof. The violence continuing forced the inner portion of the clavicle over the first rib, causing a second fracture at that point.

(2) That the one at the inner end occurred first, it being broken by leverage over the rib, and on account of the strong muscular and ligamentous attachments internally, and the acromial articulation externally, it either had to be torn from these, or to fracture at the outer end.

(3) That they both occurred simultaneously. To my mind the first is most plausible. The blow from the hoof left a distinct mark, and at the point of the outer fracture the contusion to the surface was greatest.

I reject the third theory—namely, simultaneous fracture at two points in the same bone—on the theory that the impact of a blow sufficiently strong to produce so great an injury would have engendered grave constitutional symptoms.

Ashhurst[1] reports a case of multiple fracture due to direct violence, which became compound secondarily from suppuration. The patient eventually recovered after necrosis of a portion of the bone.

Malgaigne[2] has seen in a little girl a double fracture of this bone, in which the middle fragment, about two centimetres in length, was situated vertically between the two others. All attempts to disengage it were futile. Callus was deposited, and marked deformity followed.

[1] Principles and Practice of Surgery, Ashhurst, 1893.

[2] Malgaigne's Treatise on Fractures, 1859.

Conner[1] states that from the body of a man who died in the Charity Hospital, New Orleans, La., in 1864, he removed a right clavicle which had been broken in two places, the union being ligamentous at both.

There is still another case reported by Packard[2] of a specimen in the Musée Dupuytren. One of the fractures, seated about an inch from the sternal end of the bone, seems to have been oblique outward and backward. The outer fragment had consequently slipped down somewhat, and very much forward. The second fracture is seated about an inch from the acromial end. It seems to have been oblique downward and outward, so that the outer fragment has ridden up somewhat over the other without notably deviating either forward or backward.

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[1] Holmes's System of Surgery, Vol. I. (Packard.)

[2] Ibid.

REMOVAL OF A THYROID SARCOMA UNDER COCAINE ANÆSTHESIA.

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ON January 18, Dr. Shie, of Fredericksburg, called upon me with a patient having a goitre. The patient, Miss A., was twenty-two years of age, and had always been delicate. More than two years ago she noticed an enlargement in her neck, which had gradually increased. until at the present time it formed a very marked projection. Examination showed a tumor on the right side of the neck, filling the whole space between the ramus of the jaw above and the sternum and clavicle below. It extended beyond the median line on the left side, and on the right side backward to the border of the trapezius muscle, and its upper extremity reached well above the angle of the jaw. On palpation the tumor was found to be dense, incompressible, and entirely without elasticity or impulse. The larynx was pushed to the left side, being in the line of the angle of the jaw. The tumor projected well forward over the sternum. It was firmly fixed and could be moved only by employing considerable force. It was impossible to move it without moving the larynx and trachea with it. The carotid artery could be felt upon the posterior border of the tumor, thus being greatly displaced. Percussion over the upper portion of the sternum and clavicle did not disclose dulness. Inspection of the pharynx showed the pharynx and the velum palati to be bulged forward upon the right side, completely obliterating that portion of the cavity of the pharynx. Laryngoscopic examination under cocaine showed complete immobility of the right vocal cord. The patient spoke in a rough and harsh voice. On account of the bulging of the trachea to the left one could see but a short distance into it, the right wall of the trachea occupying the field of vision. By auscultation over the tumor the valvular sounds of the heart could be distinctly heard. There was also a venous hum.

The circumference of the neck was seventeen and a half inches. Percussion and auscultation over the lungs showed nothing abnormal. Percussion of the heart disclosed no increased dulness, and the apex was within the mammary line. The heart-sounds, however, were very loud, and the heart beat with great violence against the thoracic wall. There was nothing abnormal in the valvular sounds except, perhaps, a slight degree of roughness. The pulsations of the heart were slightly irregular, and were about 120 per minute. The eyes were not prominent, and although the heart was rapid it was thought that this was due to the general condition of the patient and was not indicative of exophthalmic goitre.

Examination of the urine showed that it contained a large amount of albumen. Microscopic examinations of repeated specimens revealed the presence of abundant pavement and round epithelium and a few doubtful epithelial and granular casts.

The diagnosis made was that of a dense, thoroughly adherent goitre. The prognosis, owing to the rapidity of the growth, was that the patient would doubtless die at no distant date of asphyxia. In considering the question of operation she was told that the dangers of operation under general anæsthesia would be so great that it could not be undertaken for two reasons. In the first place, the large amount of albumen in the urine would increase the dangers of anæsthesia, and the great displacement of the larynx together with the difficulty in respiration and the denseness of the tumor would doubtless necessitate tracheotomy during the operation. The large dense mass of tumor lying in front of the trachea would have rendered tracheotomy almost impossible as a preliminary step. In my judgment the condition of the patient was such that, if to the operation for the extirpation of the gland tracheotomy were added, the result of the operation would have been fatal. I therefore suggested to her the possibility of removal of the tumor by the use of cocaine, and said that this was possible; that the pain, although considerable, would not be unbearable, and, although, even by this means there was great danger of a fatal result, it offered the only possibility of life. I also stated the possibility of a return of the growth after removal. After careful consideration and repeated statements to the patient, during her stay of five days at the hospital, of the dangers, she decided to undergo the operation.

The patient was placed upon the table with the head extended, the neck and shoulders rested upon a hard pillow, so as to render the anterior portion of the neck as prominent as possible. A rapid sweep of the knife was carried from about the angle of the jaw upon the right side obliquely downward and forward to the left and upper border of the sternum. This was so superficial as scarcely to draw any blood, and was for the purpose of marking the line of operation. A hypodermic needle was then inserted into the line of the incision and a 2-per-cent. solution of cocaine was injected through the entire length of the incision, just below the skin. The amount of the solution injected was six cubic centimetres, making the total amount of cocaine used 1.83 grains. Immediately the incision was deepened through the integument, and a considerable portion of the cocaine must have oozed from the divided tissues. One and one-fourth grains of cocaine would certainly be a liberal estimate for the amount absorbed. I doubt if the quantity absorbed amounted to so much.

For this method I am indebted to the courtesy of Professor Kocher, of Bern, Switzerland, whose operations upon goitre I had the opportunity of witnessing many times during the past fall. The incision was carried down rapidly to the border of the sterno cleidomastoid muscle, which was drawn to the right, while the integument on the other side of the incision with the underlying tissue were drawn to the left side. The omo-hyoid muscle was divided and the dissection carried down to the capsule of the tumor. The great difficulty in the case was that the capsule did not definitely limit the tumor, as in ordinary cases of goitre. At the middle and outer portion of the tumor it had broken entirely through the capsule and had invaded and become fastened to the sheaths of the carotid artery and jugular vein. The tumor had become so thoroughly united to the trachea that it was separated from it with the greatest difficulty. Instead of being able to lift the tumor from the neck as I have ordinarily done, in this case it was an absolute impossibility, and required the most extreme care in separating the tumor from the large vessels and the trachea, as well as in removing that portion of the tumor which went down fully one and a half inches below and behind the upper border of the sternum and clavicle. There was also great difficulty in enucleating a portion which extended behind the pharynx backward and upward nearly to the basilar process of the occipital bone. The tumor was eventually enucleated, a portion of the left lobe of the thyroid gland being left *in situ*. The

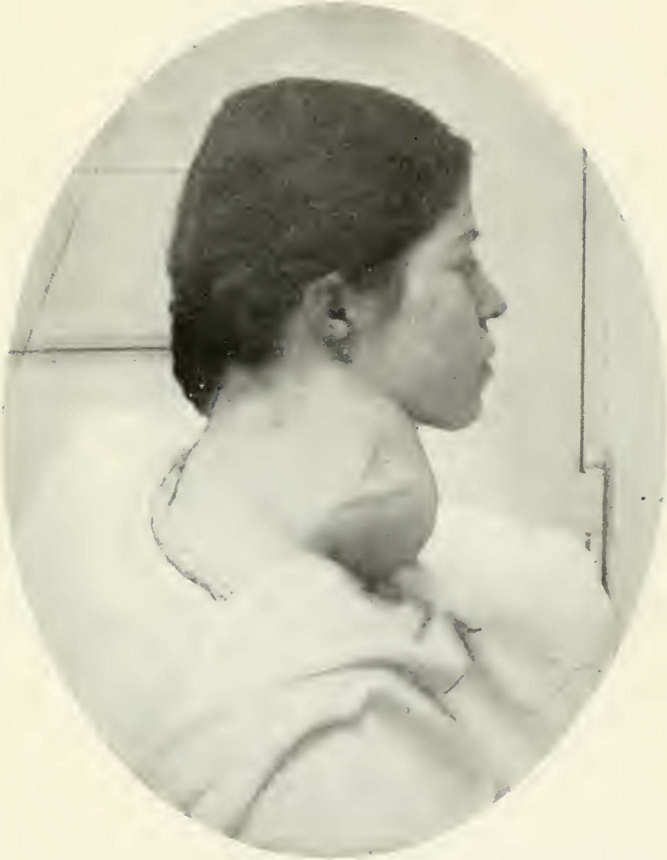

FIG. 1.—Dr. Allen's case of sarcoma of the thyroid gland.

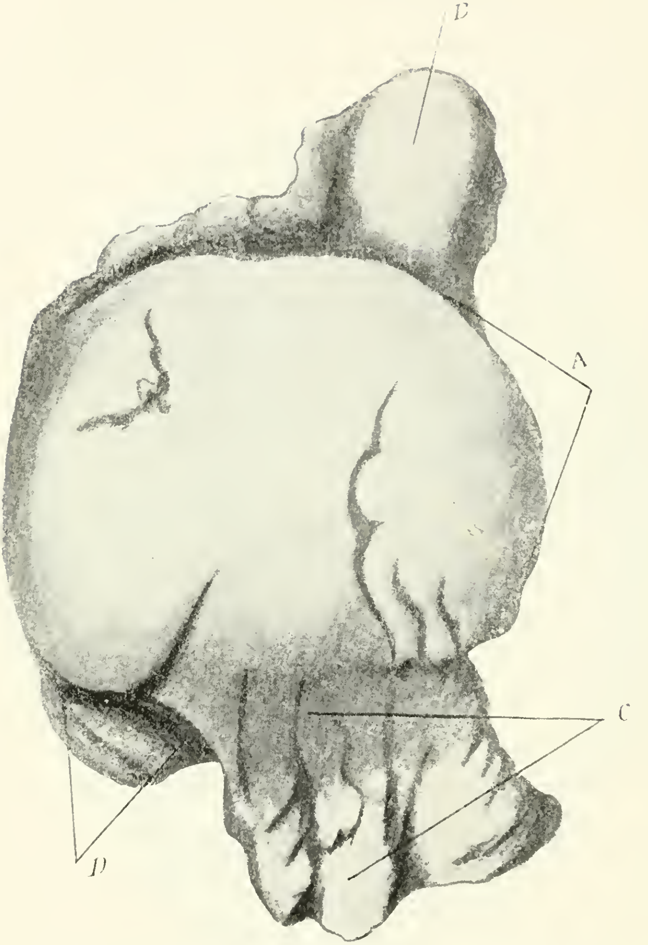

FIG. 2.—Right thyroid gland after removal. *A*, curved left border by which trachea was bulged to the left side; *B*, long projecting portion extending upward behind pharynx to basilar portion of occiput; *C*, constricted portion projecting downward one and a half inches below clavicle and sternum; *D*, portion extending downward and backward beneath trapezius muscle.

amount of blood lost during the operation, although considerable, was not at any time unusual and caused no alarm whatever. Through the operation I continued to converse with the patient, who said to me that she felt very little pain, and that I need make no haste with the operation. She conversed repeatedly with those about her, and at the close of the operation, when a patient, who was being anæsthetized in another room, made a great outcry, said we need not trouble ourselves to close the door of the operating room, since the noise did not disturb her.

When the operation was about three-fourths completed the patient seemed to grow distinctly weaker, her pulse being feeble and running up to 160. Her pulse improved, however, and although it remained 160 at the close of the operation was stronger than it had been at an earlier period. The hæmorrhage was completely controlled, and a small piece of gauze was laid along the bottom of the cavity formed by the removal of the tumor, having its exit at the lower extremity of the wound. The walls of the incision were united by a continuous suture. The operation lasted about one and a half hours.

Inasmuch as the case ended fatally, it may be of interest to discuss the elements entering into the operation, in order to decide, if possible, the cause of death. From twenty minutes to one-half hour before the operation the patient was given a quarter of a grain of morphine hypodermically, and a little later she drank one ounce of brandy. The cocaine which was injected was all injected at one time, at the beginning of the operation, and the incision in the skin was carried immediately through the portions containing the cocaine, a circumstance which must have resulted in a certain amount of cocaine escaping, thus preventing its absorption into the general circulation. The amount of blood lost during the operation was not great, since no serious bleeding occurred at any point, although there was considerable oozing after the separation of the posterior portion of the tumor lying over the carotid artery and the jugular vein. The patient throughout the operation was kept thoroughly covered and warm and expressed herself as lying very comfortably. The operation ended at 11 A.M. Five hours later the patient died. After the injection of cocaine there was no vomiting, increased frequency of respiration, cyanosis or increased frequency of pulse. Later there was a little gagging two or three times, especially when working in the neighborhood of the pharynx or dragging upon the trachea in the removal of the tumor. There were, however, none of those symptoms which I have seen in cases of rapid absorption of cocaine. The absence of these symptoms, together with the small amount of cocaine used, makes it difficult for me to believe, from present knowledge, that the cocaine could have been the cause of the patient's death. The amount of morphine used was a quarter of a grain, and it does not seem that this was sufficient in amount to have been a factor in the case. The pupils remained normal during and after the operation, showing no signs of the effect of the morphine, and the respirations were not retarded in frequency. Although the amount of blood lost was considerable, as would be expected in an operation of the sort described, it did not seem to me unusual, nor sufficient to account for the patient's condition. At no time after the operation did the patient have the irregular or sighing respiration, nor the restlessness or thirst which are commonly observed in patients who have lost a large amount of blood.

During the operation, my associate, Dr. Lee, who was watching the pulse, administered subcutaneously at intervals the total of one-tenth of a grain of strychnine. When the patient left the table I spoke to her and she said she was not suffering, and, although the pulse at that time was 160 and the patient slightly cyanosed, I felt confident that she would soon react and be out of danger. As soon as she was placed in bed a rectal injection of one ounce of whiskey and four ounces of water was administered. I saw her three-quarters of an hour later. At this time she had not responded at all to stimulation and her hands were quite cold. The foot of the bed was raised and the head lowered. A similar rectal injection was then administered and a little whiskey and water were given by mouth. She was thoroughly covered and surrounded by hot bottles, and during three hours injections of the normal salt solution were made into the subcutaneous cellular tissue by my assistant, Dr. Nevison, the sum total amounting to one and a half pints. The patient gradually sank, however, and died about five hours after the close of the operation. I do not think that the condition of the kidneys as indicated by albumen in the urine could be considered as a factor in the fatal result. The girl, as I said in the beginning of the article, was delicate and of nervous organism. I am inclined to the opinion that death was due to a complication of causes. The medication used might have been a factor, the loss of blood was doubtless another, but in my judgment we will be compelled to fall back upon the old term of "shock" to explain the patient's death. It seems to me that it is a case in which the gravity of the operation, although endured without acknowledged pain, and the large amount of tissue divided acted as the causes of death.

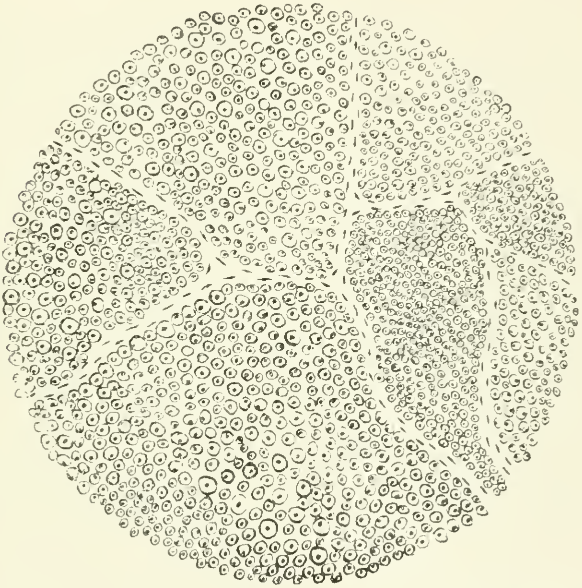

FIG. 3.—Microscopic section of tumor. Diagnosis, round-celled sarcoma.

The drawing made of the tumor presents several interesting points. As one looks at the tumor from the front the right side is convex. The trachea lay upon this curved surface in a depression. The depression could not, however, be shown in the drawing, since it is a front view. At the upper right-hand corner is a projection, which lay behind the pharynx, and reached forward close to the basilar portion of the occiput. Below and to the left is a projecting mass, which, unfortunately, cannot be well seen from the front. This projected outward and backward, extending beneath the trapezius muscle. At the lower part of the tumor is a mass which extended down into the thorax, behind the sternum. The constriction caused by the pressure of the sternum can be plainly seen. Microscopic section shows the tumor to be a round-celled sarcoma.

My object in reporting the case is to show the magnitude of an operation performed for goitre under cocaine, with little suffering to the patient and under circumstances in which the employment of general anæsthesia would have been dangerous, both on account of the condition of the patient's heart and kidneys, and on account of the danger of asphyxia as well. Although the case reported was fatal, this should scarcely deter us from the employment of similar methods of operation in other cases of goitre, since cases of equal difficulty are rarely met with. If the trachea is much compressed and respiration difficult, general anæsthesia not infrequently adds so much to the embarrassment of respiration that tracheotomy becomes necessary either before or during the operation for the removal of the goitre. There may result from this on the one side pneumonia, or, on the other side, an infection of the wound made by the removal of the goitre. In any case tracheotomy is a serious complication of the operation.

Though it is, of course, much more desirable to use general anæsthesia in cases in which there is no compression, if such compression exists to such a degree as to render probable the necessity of adding tracheotomy to the operation of thyroidectomy, the employment of cocaine as a local anæsthetic offers many advantages.

CASES OF RADICAL CURE OF PSOAS ABSCESS BY OPERATION.[1]

By JOHN W. KEEFE, M.D.,

OF PROVIDENCE, R. I.,

SURGEON TO ST. JOSEPH'S HOSPITAL; ASSISTANT SURGEON TO THE RHODE ISLAND HOSPITAL.

A PSOAS abscess is due to caries of either the last dorsal or lumbar vertebræ. The pus burrows along the psoas muscle which lies behind the peritoneum and points in the groin either just above or below Poupart's ligament. The origin of the disease, which is usually located in the body of the vertebra, is so remote from this spontaneous opening in the groin that the usual methods of treatment employed in the past, which mainly consisted of curetting, irrigating, and draining the sinus, had but little influence upon the progress of the disease. Every surgeon can recall cases of psoas abscess where the patient developed the hectic flush, became emaciated, and finally died from septicæmia. There are no cases which appeal more to the sympathies of the surgeon than these poor unfortunates suffering from psoas abscess, who are gradually wasting away, day by day, until death closes the scene.

I herewith report the histories of three cases in which I have employed a radical though extensive operation for the cure of this disease.

CASE I.—Mrs. M. C., aged thirty-four years, entered the Rhode Island Hospital on December 3, 1895. She had had more or less pain in the region of the left hip for nine weeks, and the thigh was flexed at an angle of thirty degrees. A diagnosis of hip-joint disease was made by the surgeon in charge and extension upon an inclined plane employed. Five days afterwards the patient complained of so great pain that the extension apparatus was removed, and the next day an abscess was found pointing just above the middle of Poupart's ligament.

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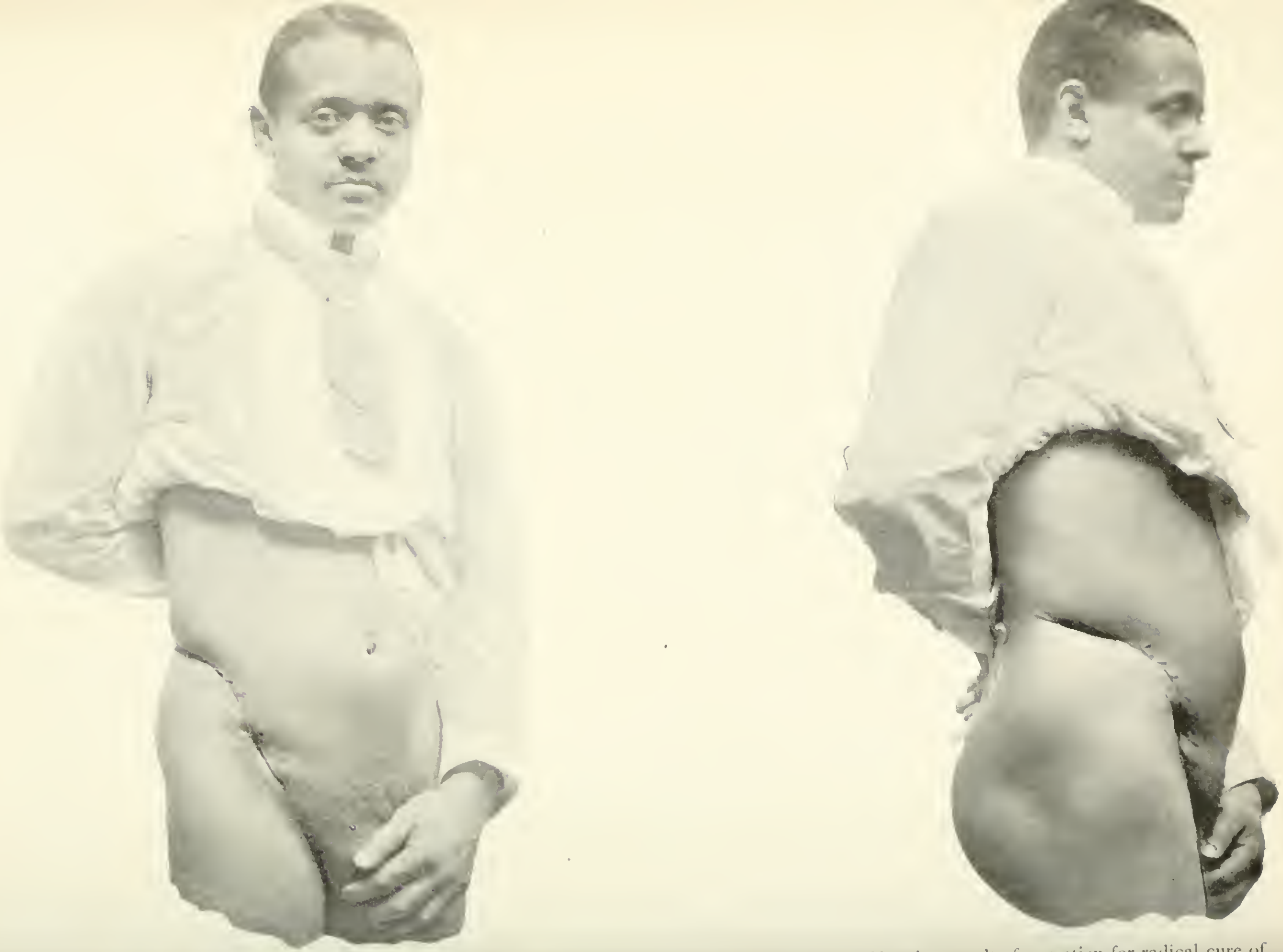
[1] Read March 4, 1897, at a meeting of the Rhode Island Medical Society.

On December 13, under ether anæsthetization, a large abscess was incised, curetted, washed out, and packed with gauze. On December 16, a great deal of pus was discharging. December 27, the sinus was explored for quite a distance along the psoas muscle. The daily dressings were saturated with pus. January 12, 1896, the cavity seems to grow larger; was discharging freely; patient extremely emaciated; profuse sweats; septic temperature and urine contains hyaline and granular casts as well as pus-cells. The patient presented the appearance of one in the last stages of consumption.

February 1, 1896, I performed the following operation, chloroform being the anæsthetic employed on account of the kidney complication: An incision was made, beginning at the opening just above Poupart's ligament and extending outward and upward towards the anterior superior spinous process of the ilium; thence about one inch above and parallel with the crest of the ilium into the loin and to within an inch of the twelfth rib. A soft rubber catheter was passed into the sinus as a guide. The peritoneum was separated from the iliacus muscle until the catheter, lying in the abscess cavity, could be reached. In the loin the incision was made so deep that the kidney was exposed and the spleen could be palpated. With the finger in the opening the bodies of the vertebra near the spinal attachment of the diaphragm could be felt.

The abscess extended from Poupart's ligament down the thigh a distance of three inches and also dipped into the pelvis. The lining of the abscess cavity and the bodies of the vertebræ near the diaphragm were curetted and the wound washed out with hot bichloride of mercury solution. Catgut sutures united the several abdominal muscles and silkworm-gut sutures approximated the cut edges of the integument. Two openings were allowed to remain, one in the loin and the other in the iliac region. Through these, drainage was procured by means of wicks of iodoform gauze.

The patient vomited at frequent intervals for three days. The temperature dropped to normal and the patient did not complain of pain. Two weeks after the operation the wound was dressed for the



Showing result of operation for radical cure of first time and the silkworm-gut sutures were removed, union having taken place by first intention. February 26: the patient is sitting up, the wounds in the iliac region and loin being dressed daily. Patient has gained strength rapidly and is now able to walk about the ward. March 26: patient has some discharge from both openings and went out of doors for the first time. April 29: patient discharged from the hospital although there still remains a sinus extending from one opening to the other.

One would scarcely recognize in the plump, healthy-looking individual of to-day the weak and emaciated being of a few months since. As the sinuses in the groin and loin never entirely healed, she was readmitted to the hospital June 17, 1896, and after trying a variety of local dressings I determined to again operate. On July 27, 1896, I did practically the same operation as I had previously performed, and found and removed carious bone from the body of the twelfth dorsal vertebra. The wound was about fourteen inches in length and was closed in the centre, leaving both ends free for the introduction of the gauze drain. Corrosive sublimate solution and peroxide of hydrogen were used as cleansing agents with iodoform and sterilized gauze for dressing. Injections into the sinus of a ten-per-cent. iodoform and vaseline mixture materially aided in the healing of the sinus.

Since January 13, 1897, there has been scarcely any discharge from the wound, and to-day it is healed.

Case II.—B. D. W., a widower, thirty-two years of age, entered the Rhode Island Hospital on May 9, 1896, with the following history:

He had multiple chancroids in January, 1895, which were treated and healed in about one week. In June, 1895, he developed a swelling in the groin which was diagnosed as a bubo and incised. It has discharged more or less ever since. Two sinuses present in the right groin, each discharging slightly. On May 12, 1896, operation by the house surgeon, ether being given. The sinuses were united by an incision, curetted, washed out, and packed with gauze. The discharge, however, still continued; so on June 20, 1896, one of the surgeons on the staff, under ether, reopened in the line of the old incision, curetted the sinus, irrigated and again packed with gauze. A bovinine dressing was tried for several weeks, but the sinus refused to heal. On July 27, 1896, the patient having been transferred to me, I operated, ether being the anæsthetic employed.

The operation was the same as described in Case I, the line of incision extending from the opening in the groin along the crest of the ilium and ending in the loin, about three inches from the median line of the back and an inch below the twelfth rib. The body of the second lumbar vertebra was found to be carious and was curetted. Thorough irrigation of the abscess cavity, and uniting the edges of the wound with the exception of the two ends, through which gauze drains were introduced, completed the operation.

October 27, 1896. The sinus in loin is completely closed. November 9, 1896: patient discharged, with sinus in the groin emitting a small amount of pus. He was treated in the out-patient department with a ten-per-cent. iodoform and vaseline mixture, and in January, 1897, his wound was entirely healed. On examining the patient (see figures) the extent of the incision can be seen and the depth may be imagined, yet there is very little loss of blood during this operation, as one meets with few vessels of any great size.

Case III.—H. L., a Chinise, thirty-eight years old, entered the Rhode Island Hospital December 29, 1896. Nine weeks ago he commenced to have pain in the left side and hip. At times the pain was severe. Finally, an abscess formed and ruptured just above the outer third of Poupart's ligament on the left side. There is present an abraded area about the size of a dollar and pus discharges freely. A probe entered two and one-half inches. He was operated upon January 2, 1897, the sinus being freely laid open, curetted, washed out, and packed with gauze. The patient continued to run a septic temperature, although quinine had been freely administered.

I operated January 12, 1897, in the manner previously described. The kidney was found normal. A large quantity of pus was evacuated, the origin of the disease being in the bodies of the third and fourth lumbar vertebræ.

January 21, 1897. The patient still has some fever, although not so high as before the operation, and during the last few days complains of pain on the opposite side, in the right groin, below Poupart's ligament.

On January 22, 1897, under ether, I removed some enlarged glands in the groin. Still feeling that there was pus in the vicinity, I cut into the muscles to a depth of three-quarters of an inch in the outer edge of Scarpa's triangle, and was rewarded by a free flow of pus. The sinus passed upward under Poupart's ligament and extended to the bodies of the third and fourth vertebræ. Another incision was made from the anterior superior spinous process of the ilium and along the crest into the loin. The abscess cavity was curetted as well as the bodies of the vertebræ involved. Free irrigation and iodoform gauze drainage were employed.

February 2, 1897. Patient sitting up in bed; amount of discharge decreasing. February 22, 1897: he was out of bed for a short time, his general condition being much improved. He is at present being treated at the hospital.

This operation is one readily performed, and will cure many cases that otherwise would have a fatal termination.

REPORT OF A CASE OF CAVERNOUS ANGIOMA OF THE SPLEEN.

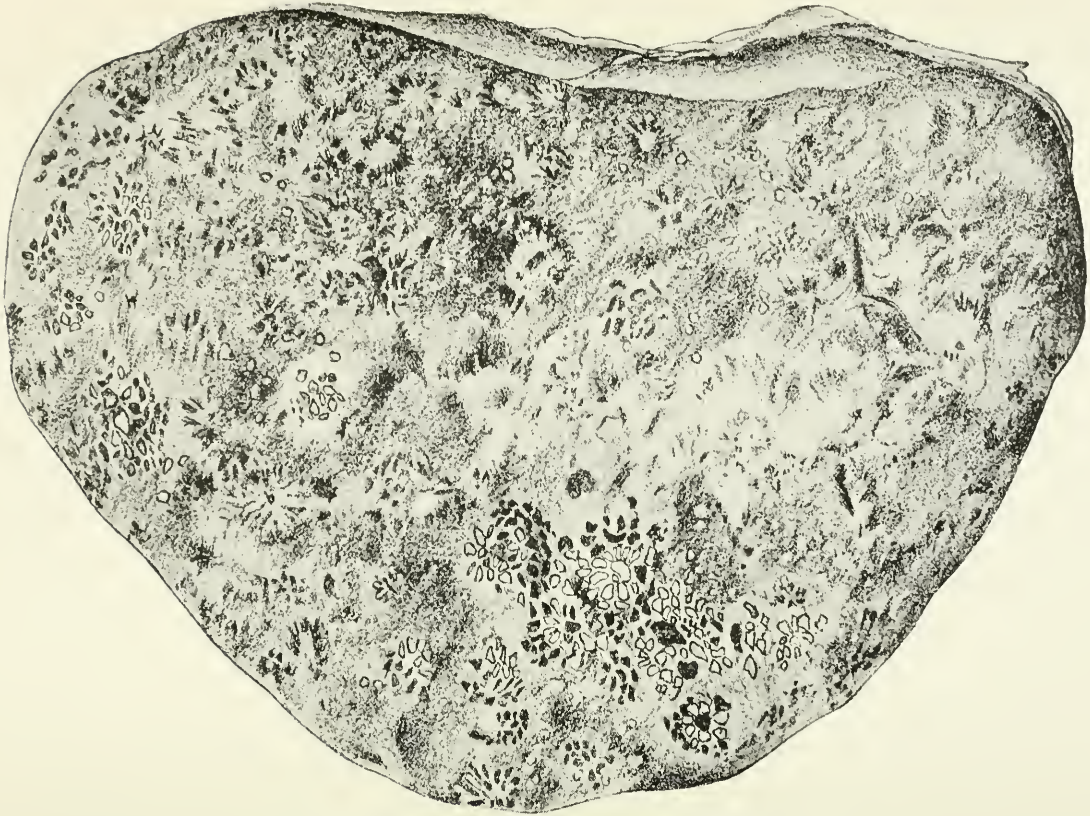
By JOHN HOMANS, M.D.,

OF BOSTON,

SURGEON TO THE MASSACHUSETTS GENERAL HOSPITAL.

AS the importance and interest in this case consists principally in the pathological character and rareness of the disease, the writer deems it best to give the description by the pathologist first, accompanied by the drawing of the tumor and afterwards to detail briefly the clinical features of the disease. The reporter has never heard of a similar growth in the spleen. There were two operations done on account of ascites, debility, and long continued illness. The first was performed on April 16, 1896. The peritoneal cavity was opened, seventeen pounds of bloody ascitic fluid were removed, and the abdomen was thoroughly bailed out. To the right of the median line, between the hepatic and splenic flexures of the colon and surrounded by omentum, was a tumor looking like an irremovable cysto-sarcoma adherent to everything in its neighborhood, particularly to the transverse colon, the adhesions to which were divided and separated with great difficulty and care ; quite large blood-vessels required ligature. This tumor and a supernumerary spleen were removed. Dr. W. F. Whitney, curator of the Warren Museum, and Pathologist to the Massachusetts General Hospital, reported as follows :

"The piece removed from the neighborhood of the colon consisted of an irregular-shaped mass about ten centimetres long by three wide, of a generally spongy, fibrous appearance, in which was much old and recent clotted and fluid blood contained in cavities. These cavities varied in size from that of a pin's head to a pea. Microscopic examination showed the spaces to be separated by bands of



Dr. Homans's case of cavernous angioma of the spleen.

fibrous tissue of varying widths, which did not always completely surround the holes, showing there must have been a free communication between them, through which blood could circulate. The tissue was on the whole poor in nuclei, which were, as a rule, spindle-shaped, but here and there were staff-shaped, suggestive of muscular fibres. There also projected into the cavities spherical masses of fibrillated material, the centres of which were quite homogeneous in structure with a concentric lamellation. The surface was covered by the lining endothelium. The whole suggested a parietal thrombus which had undergone a hyaline transformation. The spaces contained blood and the wall was usually covered by a single layer of endothelium; but occasionally there were accumulations of them mixed with blood pigment partly filling the opening. Large thick-walled vessels were found lying in the surrounding fat-tissue and passing into the fibrous structure, but a direct communication with the spaces could not be found.

"The ovaries, which were removed at the same time, showed numerous simple retention cysts, the contents of some of which were hemorrhagic. But in the tissue of the ligament there was no indication of any cavernous structure such as is described above. The condition is that of a cavernous angioma, possibly originating in the omentum. There was also a small supernumerary spleen."

The patient recovered and gained flesh and strength, but on August 12, 1896, about four months after the first operation, a second one was done, as a desperate measure, the fluid having reaccumulated. The fluid was of the same bloody character as before, but most of it was in cavities walled off by adhesions, and was very difficult to remove. The adventitious cavities were small and almost innumerable. At the site of the old mesenteric tumor were found several flattened masses which led off to the spleen, and that organ being enlarged was removed without any hemorrhage. The spleen was examined by Dr. W. W. Prescott, of the pathological department of Harvard Collsge, who was taking Dr. Whitney's place.

"The spleen was of normal shape, but enlarged, and the surface was covered by adhesions. Weight 415 grammes, length 15 centimetres, width 11 centimetres, thickness 4 centimetres. On the surface were numerous pulpish areas measuring from three-fourths of a centimetre to a few millimetres and slightly elevated. Section showed a surface taken up for the greater part by areas of a fibrous net-work, in some places filled with a reddish, in others with a light colored fluid. Their areas varied in diameter from one centimetre downward, in places separated, in others joined together. Separating these the spleen-pulp with its distinct follicles could be seen.

"Microscopic examination showed the areas to be of a cavernous structure, the spaces filled with blood, with a transparent mass similar to coagulated serum. The walls were formed of a thin connective tissue with an endothelial lining, and where the wall was formed by the spleen-tissue proper there seemed to be a slight thickening as if there had been a pre-existing space.

"The structure both in the spleen and in the peritoneum seemed to be of the same character,—viz., a cavernous angioma."

After this second attempt at a radical cure the patient failed rapidly and died of shock twenty hours after the operation.

The clinical history of the case is as follows:

The patient was a single female twenty-two years old. When first seen she was very anæmic: weight 117 pounds, pulse 142, of fair character and regular. Abdomen had been enlarged for over a year. In March, 1895, Dr. F. B. Harrington had drawn off seven quarts of bloody fluid and had found a solid tumor on the right side, which, the patient says, went away. Dr. Harrington told the patient, anxious for the truth, that she would not live ten days, so feeble was she. Other doctors subsequently tapped her, and at times a row of small lumps was noticed crossing the abdomen; never has had pain; no swelling of legs; much difficulty of breathing.

Her tappings had been as follows:

Dr. Wheeler removed ten quarts in March, 1895.
Dr. Harrington removed seven quarts ten days later.
Dr. Berry removed seven quarts in August, 1895.
Dr. Berry removed seven quarts in February, 1896.
Dr. Wheeler removed seven quarts on March 22, 1896.

All the fluid was bloody.

It will be noticed that the reaccumulation of the ascitic fluid was very irregular; sometimes it returned in large quantities in ten days, and again it did not fill the abdomen for six months. After the first laparotomy, in April, 1896, it was four months before it was necessary to interfere again. It is much to be regretted that no autopsy could be obtained, for one would like to know the condition of the other abdominal organs.

TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, February 24, 1897.

The President, Frank Hartley, M.D., in the Chair.

OBSTRUCTION OF SMALL INTESTINE FROM MULTIPLE STRICTURES; RESECTION OF TWENTY INCHES; ANASTOMOSIS; RECOVERY.

Dr. Robert Abbe presented a man in good health who came under his care in July last for chronic obstruction of the bowel. A tumor, apparently larger than the clinched fist, had occupied the right half of the abdomen along-side the navel. It was somewhat movable, and an exact diagnosis other than probable malignancy was impossible.

Incision was made over the tumor and an entirely novel condition was found. The mass of the tumor was composed of the mesentery of a portion of the small intestine, which was made solid with hyperplasia of its lymphatics, which were swollen to a size varying from a hazel-nut to a walnut, and so numerous as to separate the layers of the mesentery from the attached intestine to the spine. The special portion involved was horseshoe-shaped, fifteen inches in length, and its mesentery presented a rigid, funnel-shaped mass. No other parts of the bowel seemed involved, and Dr. Abbe therefore resected twenty inches of the diseased part after passing chain-stitches of silk through the mesenteric mass, and cutting near the bowel, necessarily leaving much of the hypertrophied gland structure. Anastomosis of the ends of the bowel was done by Murphy's button.

Recovery took place slowly, owing to sloughing of a part of the bowel at one side of the button from pressure against the metal, which made a fæcal fistula through which the button was afterwards removed. Perfect recovery has now taken place, and all the mesenteric remnant has atrophied, showing that the disease was non-malignant.

Examination of the specimen shows eight tight strictures distributed along fifteen inches of the bowel. The intermediate parts being in a state of muscular and mucous membrane hypertrophy with some papillary hypertrophy of the mucosa. The strictures are not cicatricial, are not the remnant of typhoid ulcers, nor is there any evident cause. Dr. Thacher reports there is a great lymphoid infiltration with marked muscular hyperplasia.

Dr. B. Farquhar Curtis thought it ought to go on record that the Murphy button was not a complete success in Dr. Abbe's case. It had led to sloughing and a large fæcal fistula, and this being high in the bowel it nearly cost the man his life. The button had to be removed by opening nearly the entire abdominal wound, and healing took place by granulation. The last fact rather added to the interest of the case, for the result had really been a strong abdominal scar. Probably the secret of this was that the man was kept on his back for two months or more because he was weak from losing a good deal of his nourishment through the fæcal fistula.

Dr. Abbe said he would certainly not use the button again in a similar case, nor in most cases in which it was customary to use it. He had seen many accidents arise from its use. He had employed it a number of times. In this instance he had remarked to those present that the case would probably prove to be a beautiful illustration of the advantages of the button. He had been very careful not to divide blood-vessels which would jeopardize the nourishment of the parts involved, and he could imagine no reason for the sloughing except pressure of the intestine against the metal. He had seen sloughing of the intestine from use of too large a button, in one case where a very large button sent him by Dr. Murphy caused the side of the sigmoid flexure to slough out, resulting in death. But in the case presented the button was certainly an easy-fitting one.

The specimen itself was, so far as he knew, unique, and Drs. Thacher and Herter, who examined it pathologically, said they had seen nothing like it. They found no morbid tissue except lymphoid infiltration. It took six months for complete healing of the fæcal fistula, but the function of the bowel was now perfect.

TRAUMATIC EPILEPSY CURED BY DISSECTION OF SCAR FROM BRAIN AND SUBDURAL IMPLANTATION OF RUBBER TISSUE.

Dr. Abbe presented a second patient (the first having been shown to the society October 14, 1890, and reported in the Annals of Surgery January, 1897), on whom he had successfully operated for traumatic epilepsy.

The patient, a boy, now sixteen years old, fell from a wagon five years ago, and had a compound depressed fracture of the frontal bone over the left eye. One and a half years later he began to have fits. Dizziness of a few minutes preceded each attack, followed by a faint, dreamy feeling for a few minutes and then a general severe convulsion, nausea, and a long sleep.

He had had six severe fits before operation. There was a bone defect an inch and a half long with irregular edges and pulsating centre. Operation showed firm adhesion of brain to the dura with irregular spikes of bone about it. The dura was dissected off the brain, and a circle an inch and a quarter in diameter of sterilized rubber tissue laid between them. Over this the dura and skin were sutured. Primary union followed, and the boy has never had the slightest symptom of a fit since, excepting three that occurred on the night of operation. His brain action is perfect and he works industriously. The operation was done one year and two months since.

CURED TUBERCULAR PERITONITIS.

Dr. Abbe presented a woman, aged twenty-five years, apparently in perfect health, who had come under his care eight months previously in a grave condition of tubercular peritonitis with the following history: She had had three strong children and had been in good health until six months prior to coming under observation. She then began to fail and her abdomen swelled rather rapidly. A few weeks later she was tapped and a pailful of straw-colored fluid removed.

One month later two pailfuls were removed, and this was repeated again in a month. She had had no pain and maintained a fair appetite, but lost twenty pounds during the decline. Two months later rectal prolapse occurred and persisted. She had had a dry cough for years.

On admission to St. Luke's Hospital, in June, she was in an emaciated condition with cough. Her left chest contained fluid from which two pints of turbid serum were aspirated. Respiration was rapid and labored. The abdomen was also distended with ascites. Diagnosis of tubercular peritonitis was made, and inasmuch as the patient was in no condition to bear ether anæsthesia, Dr. Abbe made an abdominal section in the median line below the navel under cocaine anæsthesia. Through a three-inch incision one or two gallons of ascitic fluid was evacuated and the general abdominal cavity freely flushed with warm saline solution. The peritoneum, both parietal and visceral, was found studded with miliary tubercles, portions of which were excised for examination. The patient bore the flushing and operation with composure and with little or no pain, aiding the procedure by turning on her side to complete the final drainage. After removal from the operating room to the ward she had a chill lasting forty-five minutes, but little or no fever. Her abdomen was somewhat tympanitic for two days, but this soon disappeared. Light diet was allowed the second day. Rapid convalescence occurred without incident, and she left the hospital apparently well on the seventeenth day after operation. Since then her health has been excellent ; no fluid has reaccumulated, and she has reached the greatest weight of her life, having increased from 106 to 132 pounds.

Dr. Charles K. Briddon asked whether Dr. Abbe had any explanation to give of the cure of the tuberculous peritonitis from opening the abdomen. He had himself seen some remarkable results from this procedure. In one instance an Italian woman was supposed to have either a tumor of the omentum or an enlarged floating kidney. Exploratory operation revealed tuberculous peritonitis with great thickening of the peritoneum, the parietes thickly covered with miliary granulations, the small intestines matted together into one large mass resembling a cauliflower, having lost all resemblance to intestine. He made the abdominal incision long and put in a tamponnade of iodoform gauze. He saw the woman two years after the operation, and it was then impossible to tell that there had ever been any trouble with her abdominal cavity. The abdomen was as soft and supple as any healthy abdomen.

But cases did not often turn out quite so favorably as this one. There was now in the hospital a Roumanian who had been subjected to the same operation without so good a result. The parts in the neighborhood of the incision improved, but there was a soft collection above and on the right side which was opened later by the house-surgeon and two weeks afterwards a fæcal fistula formed there. Two weeks ago Dr. Briddon attempted to close this fistula, and had no trouble in closing the opening in the gut (the large intestine) which he did with two lines of suture. But all of the sutures gave way, leaving the man in precisely the same condition as before. In view of the difficulty of closing such a fistulous opening, he supposed it would be best to do as Dr. Kammerer had recently done, isolate that portion of the gut by connecting the ileum with the tranverse portion of the colon. Unilateral exclusion of the intestine.

Dr. McBurney said he had been particularly interested in Dr. Abbe's case on account of the complete recovery after immediate suture of the abdominal wound. He was aware that there were various views as to why one obtained benefit after operation at all, but personally he had been inclined to think that drainage after the incision contributed to the result. He had nothing to base that idea upon except that it was the method which he had applied to a number of cases, some of them unpromising ones, with the result of cure. One was a case of ulcerative peritonitis. Superficial ulcers were to be seen all over the intestine and peritoneum lining the abdominal wall. The young boy had also a tuberculous testis with large hydrocele, enormous abdomen, puny legs, temperature 102° to 103° F. The treatment was the same as that which he had practised in other cases,—incision below the umbilicus, emptying the abdomen of fluid, irrigation with hot salt solution, and drainage. A small, glass tube and a piece of gauze were put into one angle of the wound for drainage. After a week or ten days this remaining opening of the wound was allowed to heal by granulation. This occurred three years ago, and the boy was apparently perfectly well to-day.

The idea of some that tubercle disappeared on account of exposure to air seemed hardly to hold, since in pulmonary tuberculosis there was exposure to air all the time by inhalation. This was true, also, of superficial skin tuberculosis. The only change which he could conceive of as taking place after operation, and which could produce any effect, was the change in the vascular supply of the diseased tissue. Pressure being relieved, the tissue received a larger supply of fresh blood. The cases reported this evening and others would show that none need be despaired of.

Dr. Curtis thought some cases must be explained on some other theory than that of drainage, of irrigation, or of admission of air.

In one of his cases the disease had evidently begun in the genitals, the pelvis was full of hard masses, an incision revealed a very small collection of pus behind the uterus and the peritoneal cavity obliterated by adhesions. The peritoneum was infiltrated with tubercles as far as could be seen ; hard masses could be felt extending as high as the umbilicus. No attempt was made to separate adhesions. The removal of the pus was probably the cause of the temperature falling immediately after the operation. The patient recovered, the mass in both pelvis and abdomen disappeared, although the latter had not been exposed in any way during the operation.

Dr. Curtis thought we would have to set many of these cases down to spontaneous cure. Pathologists told us that at the autopsy-table tuberculosis of the peritoneum was almost unknown in women, nearly all of the cases being in men, whereas, in the surgical field nearly all cases of tuberculous peritonitis were in women, seldom in men. If the disease were a fatal one the proportion of cases ought to be about the same in both sexes. But the fact that women did not die of the disease, and at autopsy the female peritoneum was so rarely tuberculous, proved that spontaneous recovery took place in them, since operations showed considerable frequency of the disease in women during life.

Dr. Francis W. Murray, having been requested to examine Dr. Abbe's patient, reported that the abdominal walls were soft and pliable, no masses could be felt, no fluid was present. The scar was in good condition, but the walls had given way at one point near the middle of the wound, forming a small ventral hernia.

Dr. Abbe replied that he had looked over the literature of the subject rather extensively the past year, and had found a good deal upon it in different languages which was interesting, and some of it fairly conclusive, but it did not settle the question why there was cure. In a few cases in which tuberculosis of the peritoneum was found at operation death resulted from other causes a year or more subsequently ; an autopsy showed that the disease had disappeared. A very beautiful case was that of Welch, in which tubercle bacilli were found. In one instance, reported by a French physician, the woman also had a pleurisy, cough, emaciation, all of which disappeared together with the tuberculous peritonitis on aspiration of the abdomen.

As to the cause of cure, the theory of hyperæmia seemed to be the one most generally accepted. While flushing out the abdomen did not seem necessary, yet it was an advantage. The French showed some preference for camphor naphthol as an injection, and thought they had witnessed some excellent results. Many other things had been injected, but nothing seemed more effectual than simple evacuation, or evacuation with flushing by warm saline solution.

AMPUTATION AT HIP-JOINT WITH INTRA-ABDOMINAL DIRECT PRESSURE OF COMMON ILIAC TO CONTROL HÆMORRHAGE.

Dr. Charles McBurney presented two patients who had been subjected to amputation at the hip-joint, and in whom the hæmorrhage had been controlled by intra-abdominal direct pressure of a finger upon the common iliac artery. (For his remarks in connection with these cases, see page 610.)

Dr. Briddon stated that the method of controlling hæmorrhage described by Dr. McBurney, had reduced the mortality from hip-joint amputations very markedly. He thought it was more especially applicable to those cases of sarcoma of the head of the bone where, on account of the high seat of the disease, Wyeth's pins would interfere with the technique of the operation. He had himself used the pins with satisfaction. The method practised by Dr. McBurney was certainly preferable in cases of tumor, decidedly better than that of Davy's lever for compressing the common iliac, and some others which had led to disastrous results. But in tuberculous processes the speaker would prefer to use pins. He would feel more comfortable with pins introduced and a tube around them than with the finger of an assistant upon the artery, no matter how careful he might be. The method of Dr. F. Tilden Brown was also likely to prove of value in the future, although at present it had the objection, the speaker thought, of prolonging the operation.

Dr. F. Tilden Brown, referring to the difficulty of getting at the acetabular cavity, said that in the only case of hip-joint amputation in which he had used the pins and rubber tube for controlling hæmorrhage he found the muscular flaps brought in so close apposition that trimming up the acetabular cavity was extremely difficult, and if there had been any bleeding which he might have wished to control by ligature it would have been almost impossible to apply it. His method of applying the clamp to the femoral vessels, to which allusion had been made by Dr. Briddon, would be found quite easy if one jaw of the clamp were inserted beneath the sartorius and the vessels, the other allowed to rest on the cutaneous surface, compressing the vessels between them. It was in the line of the incision for removal of the bone, and consequently did not add to the shock or gravity of the operation as did, in his opinion, the tight bands in Wyeth's method. Instead of the abdominal incision to make pressure upon the vessels, as practised by Dr. McBurney, he thought it would be sufficient to introduce the forefinger under the sartorius and Poupart's ligament and make pressure upon the vessel.

Dr. McBurney answered that there was not the slightest danger that the finger which controlled the vessel would slip. Nor did the finger get tired, for very little force was required. The method possessed also the advantage that when one wished to find the ends of the smaller vessels when the time came for permanently closing them with the ligature their locality was quickly revealed by simply relaxing the pressure a trifle or for a moment. The advantage over the clamp or the forefinger passed under the femoral vessel was that, as compression was exerted upon the common iliac, hæmorrhage from the posterior part of the stump was also controlled. Under the methods referred to by the previous speaker, he had seen a good deal of bleeding going on from the posterior part of the wound throughout the operation. There need be no trouble from the femoral, for, if one did not wish to clamp it, he could cut down upon it and tie it before the operation, as it was readily enough found. It was from the posterior part of the stump that hæmorrhage came, which it required some ingenuity to control.

PRELIMINARY TRACHEOTOMY IN OPERATIONS ON THE UPPER AIR-PASSAGES.

Dr. F. W. Murray read a paper with the above title, for which see page 600.

Dr. Charles McBurney thought the operative step described, preliminary tracheotomy, was one of very great importance and value in a large class of cases. It was one which he had resorted to a great many times in cases requiring operation about the mouth, pharynx, tonsils, upper and lower jaw, and larynx, and in no instance, so far as he remembered, had it given rise to any accident or complication. The feature which especially commended it to him, while its other advantages were great, was one referred to by Dr. Murray, and this could not be too strongly dwelt upon,—namely, that the method permitted the operator to do certain operations with a completeness which could not be reached without it. A great many of the cases belonged to one of the various forms of malignant disease where it was very desirable to do a complete, a wide, even a prolonged dissection in a very careful manner, with frequent inspection of the field of operation. While it was possible to do these operations without preliminary tracheotomy, yet it was not possible to do them in such a manner as to give the operator confidence that he had removed all of the disease and that every provision had been made against recurrence. Without preliminary tracheotomy operation for malignant disease which involved the air-passages usually seemed to him most unsatisfactory. The patient might not die. Indeed, he thought the danger from hæmorrhage had been exaggerated. But without preliminary tracheotomy the disease could rarely be removed completely and satisfactorily.

Dr. Briddon believed Niebuhr had first introduced preliminary tracheotomy. He was certain that he had himself employed it as long ago as twenty-five years at the Colored Home in a tumor of the jaw. The pressure effects of the Trendelenburg tube, or of any tube, were sometimes extremely disagreeable. The method of Niebuhr was very simple, consisting simply in introducing a tamponnade into the pharynx, an ordinary canula into the trachea with tube twelve inches long attached to a funnel covered with flannel through which chloroform was administered. He always preceded the operation by a hypodermic of morphine, the influence of the morphine making it unnecessary to use so much chloroform.

Dr. Abbe said that in the use of the various tampons one was likely to see blood pass the tampon and enter the trachea. The Hahn tube, which he had used a good many times, was not sure to fill the trachea with the moistened sponge. The Trendelenburg, which he had used, was equally likely to lead to harm as Dr. Briddon had suggested. Moreover, as Dr. Murray had said, above the rubber tampon a certain amount of blood collected which probably would enter the trachea when the tampon was removed. He had, therefore, come to use only a large tracheotomy tube and pack the pharynx. From his own experience he preferred this method above all others. In laryngectomy, an operation which he had performed only six times, the advantage of packing around the tube with little sponges, each with silk thread attached, was very great. For etherization he used a folded gauze pad held over the tracheotomy tube.

A final point which Dr. Abbe would emphasize was that the tracheotomy ought to be done at the time of the major operation. It added but little to the operative risk.

NEPHRECTOMY FOR HYDRONEPHROSIS, NEW INCISION.

Dr. Abbe presented a kidney removed ten days previously from a woman, aged thirty-six years. The patient had been in good health, but had a large tumor of the right ilio-hypochondriac region, which had been variously diagnosed as ovarian and high uterine fibroids. It was, indeed, rather low for the usual renal tumor, but filled the lumbar region, and its dulness was continuous with the liver. It had been noticed for two years, and occasionally had been observed to lessen in size coincidently with increased flow of urine. Diagnosis of hydronephrosis having been made, Dr. Abbe proceeded by an unusual route to approach the kidney more from in front, intending to remove also the ureter after the practice of Dr. Kelly.

An incision was made from a point one inch inside the anterior superior iliac spine, upward and backward four and a half inches, in a line parallel with the fibres of the external oblique muscle. The abdominal muscles were now separated, as is done in the McBurney method, for approaching the appendix. At this high situation the parting of the muscular fibres is easily accomplished to a greater degree than in the lower iliac region, and by introducing the two index-fingers one can readily make an opening which admits of all necessary manipulation—with greater facility than the usual lumbar route—without dividing any muscular fibres. The peritoneum having been reached, the index-finger is pressed backward to the perirenal fat, and readily sweeps the peritoneal sac off the front of the kidney. With good retractors, one now readily inspects the pedicle and can separate the ureter. In case of hydro- or pyonephrosis, aspiration will now empty the fluid and reduce the bulk of the tumor before removal. Through this anterior incision the finger can readily follow the ureter to the brim of the pelvis and tie itoff, as in the case shown. After tying the pedicle with catgut of suitable strength, the abdominal wall falls together in the lines of muscular separation, and three interrupted catgut stitches are applied to each. A small rubber drain may be inserted for one day, if there has been extensive stripping of tissues, but this will usually be unnecessary.

This method has these advantages,—

It allows operation in the most advantageous position for the patient and operator.

It gives about the best access to the kidney and ureter.

It is the most bloodless method, as no muscles are cut.

It allows immediate suturing of separated muscles, with strongest possible condition of the abdominal wall, precluding subsequent hernia because of the crossing of planes of muscular separation, as in McBurney's method for appendicitis.

The patient from whom this kidney was removed had primary union of the wound and was out of bed on the tenth day. The cause of hydronephrosis with atrophy of the kidney was beautifully shown to be a valve-like fold of the pelvis of the kidney at the beginning of the ureter.

RECURRENT SARCOMA OF REMAINING KIDNEY FOUR YEARS AFTER REMOVAL OF FIRST KIDNEY FOR SARCOMA.

Dr. Abbe presented a sarcomatous kidney removed at autopsy from the body of a child on whom he had performed nephrectomy for sarcoma of the other kidney four years and a half previously. In the mean time, and until recently, the child had been healthy, the disease in the second kidney had become manifest only a few weeks ago, and why there should have been this recurrence after so long an interval he was unable to explain, as other organs were free. It must have been that the child had a double congenital defect of its kidney, developing consequently as sarcoma more than four years apart.

The other case, which he had mentioned on several occasions in connection with this one, showed no recurrence, the child being quite well over five years after the nephrectomy.

GASTRO-ENTEROSTOMY FOR CANCER OF THE PYLORUS.

Dr. Abbe presented a third specimen illustrating the result of suture anastomosis between the duodenum and anterior wall of the stomach on account of obstruction of the pylorus by cancer. The patient was much emaciated, and he performed the operation last summer simply with a view to somewhat prolonging life. Although he tried to make the loop in such a way as not to have it drag and obstruct, yet it so happened in this case, as in many others, that there was backward flow of bile and vomiting, and after four or five days he made anastomosis by Murphy's button between the distal portion of the duodenum and the neighboring portion of the ileum. The man survived this operation two or three days. The specimens showed the excellent anastomosis by the two methods. The Murphy button, however, had blocked the small intestine too much, although it was one of the smallest made. The anastomosis was secure in every way, yet he thought it had added to the trouble. He believed that in a similar case he would simply cut the intestine in two, a distance of a foot or a foot and a half below the stomach, plant the distal end directly into the stomach and the proximal end into the small intestine lower down, making two anastomoses so as to avoid an obstructing loop.

TRANSACTIONS OF THE SECTION ON GENERAL SURGERY OF THE COLLEGE OF PHYSICIANS OF PHILADELPHIA.

Stated Meeting, February 12, 1897.

W. W. Keen, M.D., President, in the Chair.

THE REMOVAL OF A FOREIGN BODY FROM THE MALE BLADDER, WITH AN ANALYSIS OF TWO HUNDRED AND TWENTY-ONE OTHER CASES.

Dr. Francis R. Packard, by invitation, read a paper with the above title, for which see page 568.

Dr. W. S. Forbes inquired whether Dr. Packard had recorded the case operated upon by Dr. Packard when surgeon to the Episcopal Hospital, of a man who came into the ward suffering with vesical trouble. A small sound was put in and a foreign body felt, but the location of it was in doubt. When a large sound was put in to dilate the urethra the foreign body was found to be in its membranous part. A median perineal incision was made and a piece of bone taken out about one-half as broad as one's finger-nail and nearly one inch in length. This man had been in the hospital some years previous with broken ribs. The part taken from the urethra was the under border of a rib, the groove under its border was manifest. The fragments of bone appeared to be a part of his broken rib. Dr. Forbes did not know whether that case was ever published.

Dr. Orville Horwitz said that his experience with foreign bodies in the bladder had been limited to two cases; one of which occurred in the Philadelphia Hospital. The patient was suffering from retention of urine due to a hypertrophy of the prostate gland, for the relief of which he employed a hard-rubber catheter. On attempting to remove the instrument it broke about three inches from the eye; the broken portion remaining in the prostatic urethra. An attempt to remove it through the urethra only resulted in pushing the portion of catheter into the bladder. As it was impossible to insert a lithotrite an external perineal urethrotomy was performed and the body removed.

The second case was an insane patient suffering from retention of urine; an old, soft-rubber catheter had been passed, and on removing it it seemed to be grasped by a spasmodic contraction of the muscles of the urethra and a portion of it was left behind. In this case Dr. Horwitz was enabled to grasp the foreign body by means of a small lithotrite and remove it.

Dr. Horwitz thought that, as a rule, if there is no stricture or hypertrophy of the prostate gland, the foreign body can be removed by means of the lithotrite. If it has been in the bladder for a long time and is large and bulky, owing to its having become encrusted with phosphates, and there is marked cystitis, it is probably wiser to do an external perineal urethrotomy.

Dr. W. W. Keen said he had had two cases in which portions of catheters had been broken off in the bladder. In both there was no possibility of removing by the lithotrite, and he removed both by suprapubic cystotomy. One was a man past 70 years of age.

Dr. Francis R. Packard stated that in all the cases he had collected the foreign body had been introduced *per urethram*. He had found many cases in which the foreign body was said to have been swallowed, also many, notably in the "Surgical History of the War of the Rebellion," in which bullets had been found in the bladder. He had not included these in his analysis, nor had he included any of the cases in which ligatures or sutures had formed nuclei of calculi.

RUPTURE OF A SUPPURATING OVARIAN TUMOR.

Dr. John B. Roberts reported a case of death from acute septic peritonitis due to rupture of a suppurating ovarian tumor. The patient was waiting for ovariotomy to be performed on the following day, when she developed acute abdominal pain, and died in a few hours, just before operation for the peritonitis, recognized to be present, was commenced. Autopsy showed violent peritonitis from rupture of a suppurating ovarian tumor, probably a papillary cyst.

SACCULATED BLADDER.

Dr. John B. Roberts also reported a case of chronic bladder-disease in an old man. He performed suprapubic section and found what seemed like a second bladder cavity at the right side of the main bladder cavity. Between the two was an opening in the partition sufficiently large to admit the end of a finger. The sacculation did not seem like those found in cases of hypertrophied bladder from old cystitis; and the history did not correspond to that condition. There was no calculus in the bladder, for which reason he thought that possibly the sacculation was congenital. Drainage by a canula was continued through the suprapubic opening and the patient has been comfortable.

Dr. Forbes said we sometimes have an hour-glass contraction of the bladder. He had such a case in which there were two stones; one in each compartment. The patient was an old man. The compartments were about the same size. He thought he had finished crushing the stone in the inferior one, and on further examination the sound distinctly passed through the constriction, and he could feel the constricted part, and in the upper and posterior portion was a stone as large as that in the anterior inferior part. The constriction appeared to give the patient no trouble whatever, there was nothing to indicate there was such a condition of the parts, yet Dr. Forbes was confident of the constricted condition of the bladder, and that this had existed for a long time.

It may have been congenital. The man was old, he had never complained of anything except vesical trouble indicating calculus, nor did Dr. Forbes suspect a second calculus until he had crushed the first, when he discovered the second by elevating his instrument, while examining to see if there was any remaining *débris*. He could carry his lithotrite, which has a blade of one and a quarter inches in its greatest extent through the constriction. In placing it on the edge of the constriction between the two ureters, it would just touch the arch over the lower border, and going into this narrow or constricted part there was quite a large space. Behind the bar there was a sac quite as large as the anterior one.

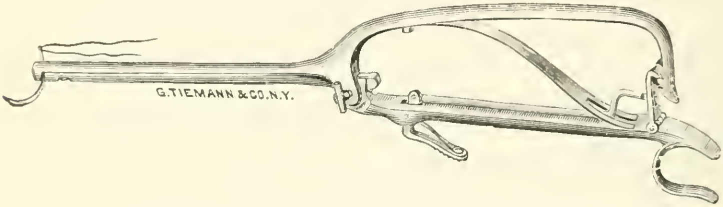
THE DEPORTMENT OF NEEDLES PENETRATING THE TISSUES.

Dr. Oscar H. Allis read a paper with this title, for which see page 614.

A NEW NEEDLE-HOLDER.

Dr. Oscar H. Allis presented a needle-holder, saying that, while formerly, when the surgeon had comparatively little work to do but surface suturing, the fingers and thumb answered every purpose, the general and special surgeon to-day has great need to familiarize himself with some variety of needle-holder. The perfect needle-holder is yet to be invented, but this may only be accomplished when the excellences of very many shall be combined in one.

Two essentials are required in any needle-holder,—one, a vise grip, the other, an instantaneous release. He had seen a needle tear out because the surgeon could not let go of it while a patient was struggling. In the instrument shown in the accompanying cut the release is under the control of a flute key which lies under the forefinger. Like all instruments, it requires one to familiarize himself with it, when he will find that he can catch and release his needle noiselessly and instantaneously, qualities that are highly prized by some surgeons. It is strong enough for the heaviest suturing and slender enough for the most delicate.



Explanation of Figure.—The flute key is under control of the forefinger,—the little finger rests in the loop at the end of the instrument. The instrument is held in the hand as shown in the figure.

TUBERCULOSIS OR CARCINOMA (?) OF THE STOMACH; EXPLORATORY CŒLIOTOMY; SUBSEQUENT APPARENTLY COMPLETE CURE.

Dr. W. W. Keen reported the following case: A physician, aged 51 years, first consulted him May 13, 1896, with Dr. Wright, of Erie, Pa. His family history was excellent, his parents and grandparents having nearly all died of old age, at 80 years and over, with the exception of his mother, who died from some obscure disease of the stomach, probably carcinoma. The patient himself had always been well till about six years before, when he began to suffer with much gastric distress; a sense of weight and pressure extended through the body from the pit of the stomach to the back to a point to the right of the spine on a level with the lower angle of the scapula. No tumor had ever been perceived. He had lost but little weight, (ten to fifteen pounds) in these six years, but within the last five weeks he had lost ten to fifteen pounds more after a very severe sudden hæmorrhage from the stomach, amounting to about a quart. In addition to this not less than a pint, he thinks, escaped by the bowels. No recurrence of the hæmorrhage had taken place, but he had vomited for the last five weeks a dark-looking fluid in which blood was recognized by Dr. Wright on microscopic examination. The stools also had shown evidence of blood passing by the bowel. For four weeks after the hæmorrhage he was nourished exclusively by rectal enemata, but for the last week had been able to take a small amount of peptonized milk by the stomach.

He was a slightly sallow man, apparently quite sick, and had lost much strength. His weight was about 110 to 115 pounds; his pulse was good. Examination of the chest was negative. The urinary report by Dr. Kyle was negative.

On examining the abdomen no distinct tumor could be felt, but there was a distinct sense of marked resistance in the epigastrium; the liver dulness was considerably lessened in the vertical direction. The inguinal glands on both sides were enlarged. He was kept in bed, continued to take the peptonized milk with a small amount of stimulants and a pill consisting of opium, nitrate of silver, and belladonna, which Dr. Wright had already prescribed and which seemed to give him relief. No hæmorrhage was observed while he was in the hospital. After nine days he seemed well enough for an exploratory operation, the expectation being that a cancer of the stomach would be revealed.

The operation was done May 22, 1896. There were present during the operation, Professor J. H. Etheridge, of Chicago, Dr. W. A. Edwards, of San Diego, Cal., Dr. J. J. Buchanan, of Pittsburg, and Drs. J. M. Baldy, William J. Taylor, and George W. Spencer, of Philadelphia. A vertical incision was made through the middle of the left rectus. The stomach immediately presented and was drawn out. The site of the disease was found to extend towards the cardiac extremity of the stomach, and, in order to reach it fully, the incision was extended upward to the border of the ribs. Even then it was only possible to bring about half of the stomach into the abdominal opening and almost none of the upper end. By holding up the abdominal walls, however, a view of nearly all the stomach was obtained. From the cardiac end towards the pylorus the disease extended as an infiltrating growth, both anteriorly and posteriorly, over an area extending over nearly the whole of the stomach. It did not reach quite to the pylorus. The mass was nodulated, hard, and thick, and every one present believed that it was cancerous. It was so extensive that no room was left for a gastro-enterostomy, so the abdomen was closed. Before doing so two enlarged glands in the great omentum were noted, and around one of these a ligature was cast, and it was removed for microscopical examination.

The patient made an uninterrupted recovery. Shortly after the operation, he began to take liquid, and then semi-solid food, and soon afterwards solid food, and left the hospital about three weeks after the operation, having not only recovered from the operation, but being, apparently, on the high road to health. Dr. Keen was much surprised when, later, Dr. Kyle made the following report: "Certain areas showed small nodules surrounded by dense fibrous tissue. The blood-vessels, while not entirely obliterated, showed thickening of the walls, especially the intima. It is undoubtedly tubercular."

In August, three months after the operation, he reported that his weight had increased to 171 pounds, and in October it had risen to 178½ pounds; his appetite, digestion, and assimilation were excellent, and he suffered no pain. In fact, his only trouble was an occasional sleepless night. His diet in August consisted of "bread and butter, milk, eggs, potatoes, beefsteak, mutton, fish, rice, oatmeal, and fruit." He had been taking some syrup of the hypophosphites and cod-liver oil in consequence of the diagnosis.

Dr. Keen said that he had mentioned the names of the gentlemen present for the especial reason that those present at the operation, all men of large experience, agreed that the disease was unquestionably carcinoma of the stomach. The result of the case seemed to leave no doubt that the microscopical diagnosis was correct and the clinical diagnosis was wrong. The enlarged glands in both groins should, perhaps, have made him suspect that it might not be a carcinoma, especially in view of the additional fact that the disease had probably existed for six years. The happy result of the treatment is another testimony to the value of an exploratory operation even in supposed cases of cancer. Difficulties presumed to exist will often be found absent when the abdomen is opened, errors of diagnosis are corrected, and in a few cases, even if the diagnosis is found to be presumably correct and nothing can be done, the patient is cured. No tubercular involvement of the peritoneum at any other point than the great omentum was seen. The simple abdominal section, as in so many cases of tubercular peritonitis, seems to have cured the patient entirely. Even the ulceration which existed, and which was a seriously threatening factor in his case and attended with dangerous hæmorrhage, seems to have healed entirely, so that not only has there been no recurrence of the hæmorrhages, but he has been able to resume a most varied diet and within three months gained about sixty pounds in weight.

The case illustrates also the danger of drawing conclusions as to the disappearance of cancer after abdominal section unless a microscopical examination has been made. The clinical inspection of a tumor is not sufficient to decide upon its malignancy, and in all cases in which no operation can be done, it is desirable, unless the procedure should involve any unwarranted danger, that a piece of the tumor should be removed for a microscopical diagnosis.

Dr. D. D. Stewart said this was the first case of which he was acquainted in which the symptoms were so suggestive of carcinoma without its being of that nature. Dr. Keen did not speak of the condition of the stomach prior to the operation, so it is impossible to say whether that would have put one on the track of the pathological condition of the stomach underlying the trouble. Conditions affecting the secretory and motor activity are characterized by the same condition, disappearance of hydrochloric acid, disappearance of the ferments largely if not entirely, and if the growth is about the pylorus, narrowing and obstructing its lumen, the appearance of lactic acid fermentation, due to the consequent stagnation of the ingesta, leading to bacterial growth. Dr. Stewart stated that he had recently seen a case with Dr. Morton that was very interesting in this connection. A young man, aged twenty-eight years, with symptoms of very decided stenosis, emaciated to a degree, with profound anæmia and symptoms of profound gastric enlargement, hydrochloric acid absent, etc. He could not believe the case was one of carcinoma. Dr. Morton did a gastro-enterostomy with Murphy's button and the patient is doing very well. In that case there was a history of syphilis two years before in which the man said he had been actively treated. It seemed scarcely probable such was the case as his blood pointed to active syphilis, he having a marked lymphocytosis and eosinophilia. Dr.

Morton put him, at Dr. Stewart's suggestion, on mercurials, slightly ptyalizing him, which resulted in a disappearance of the blood condition suggestive of syphilis.

Another case referred to Dr. Stewart by Dr. Roberts, in which he suspected carcinoma, has improved in the same way without operation. In this young man there were decided symptoms of carcinoma without obstruction. In younger patients, of course, there is always more doubt regarding the carcinomatous element.

Dr. T. S. K. Morton said his father had operated on a case in which an exploratory section revealed an infiltrating carcinoma of stomach so extensive as to prohibit a gastro-enterostomy. That man, although he had persistently vomited for six weeks, at once commenced to take large quantities of food. He gained much flesh and strength, but several months later his pylorus closed again and he perished.

The case of which Dr. Stewart had spoken supplied the picture of carcinoma; it was a very extensive infiltration, apparently around the pylorus and possibly the head of the pancreas, in which Dr. Morton had made an opening into the jejunum and the patient had done remarkably well. He thought Dr. Stewart a little too sanguine, perhaps, about the effect of the mercurials, because the patient is also having ferruginous tonics and a large miscellaneous diet. He has improved very much, is much more comfortable, and promises to make a temporary recovery. When Dr. Morton heard that his father's case had perished after a similar interval of improvement he began to feel suspicious as to the future of the present case. The Murphy button had not passed up to four weeks after operation.

Dr. J. M. Barton remarked regarding the symptoms of pyloric obstruction in cancer of the stomach, disappearing after section and manipulation, that it might be due to the growth not being directly in the pyloric opening, but to one side of it, and in the resulting puckering of the mucous membrane one of its folds acted as a valve.

On several occasions where there had been great dilatation of the stomach and other well-marked symptoms of pyloric obstruction, he had found the growth to lie one side of the pyloric orifice and the real obstruction to be a fold of the mucous membrane which could be quite readily displaced. He could readily see how a little manipulation of the growth, a little tearing of the fold from its attachments to the growth, or even a change in the position of the stomach might relieve all the obstructive symptoms. It is well known how large a cancer of the stomach may grow without marked symptoms if it produces no obstruction of either orifice.

He had had no experience with any disappearing tumors of the stomach, but he had recently exhibited before the Academy of Surgery a young man from whom an abdominal tumor, seven inches in diameter, disappeared after section and manipulation. The case was reported in the December number of the ANNALS OF SURGEY.

DR. ALFRED STENGEL presented a specimen and the following history of a case, illustrating the spontaneous subsidence of a tumor of the abdomen: The specimen was removed from the body of a patient whose history had been reported previously for the Association of American Physicians. The patient was an old man, who gave a fairly good history as to habits of life, and, in particular, denied the possibility of syphilis. He suffered with symptoms which were considered to be those of chronic gastritis, and during his stay in the hospital great care was taken in the examination of his stomach. It was inflated with air and the contents were carefully analyzed, these showing that the patient had some diminution of glandular activity of the stomach and no dilatation. He had a tumor in the right hypochondriac region which, while near enough to pylorus to cause suspicion on first examination, was subsequently found to be unconnected with the pylorus, auscultatory percussion and inflation brought out this fact. After a good deal of consideration a diagnosis of tumor of the lower edge of the liver in all probability involving the gall-bladder was made. The patient remained in the hospital for some time under treatment and observation, and examinations were made repeatedly. Finally it was decided to perform an operation, and this was done by Dr. White. On opening the abdomen there was upon the anterior surface of the left lobe of the liver a large white tumor. From recollection he would now say that this was probably three and a half inches in diameter, a flat elevation, yellowish-white in color, having characters that all at once decided were those of cancer. In putting his hand beneath the edge of the liver, Dr. White said he could feel other but smaller nodules in that situation. He palpated the pylorus and decided there was no tumor there. The case was then very puzzling. There was no other tumor, no primary seat of carcinoma in any part of the body, though every possible part was searched. The tumor in the liver, if it were cancer, was evidently a secondary growth, yet no evidence of cancer of the pylorus, pancreas, intestines, thyroid glands, or other parts could be found.

The patient, after exploratory operation, immediately began to recover, and in the course of probably two months he had gained considerably over twenty-five pounds. At the time he was reported at Washington he had gained that amount. He stayed away from the hospital the entire summer and returned a few months ago.

When he first came to the hospital he had a tumor so large that it was clearly palpable and visible through the abdominal walls, and it was frequently demonstrated to ward classes. After operation it was found that the tumor was growing less, and when he returned a few months ago there was scarcely any sign of it.

Unfortunately, the man plunged through an elevator shaft and broke his neck. At the post-mortem examination the left lobe of his liver was manifestly atrophied. It had certainly been larger when he first came under observation. The tumor is a syphilitic gumma. Microscopic examination of this is positive. The mass that was visible on the anterior surface has almost disappeared and has left only a puckered scar. The masses on the posterior surface are smaller than they were.

The man was one of more than average intelligence, and we therefore gave considerable credit to his denial of syphilis.

Dr. Stengel had seen two cases of "disappearing-tumors" of the stomach. One case was one of apparently very large carcinoma of the stomach. The day he visited him he was in the act of emesis and vomited a large quantity of coffee-ground material. The analysis of his stomach contents gave the results to be expected in carcinoma. There was complete absence of hydrochloric acid in the few examinations made, and considerable lactic acid was present. His appearance was that of carcinoma. He was a man of considerable importance in his community and a good deal of attention was paid to him. Some time later, in speaking rather confidently about one phase of the next case to be reported with the physician who had treated the present case, his colleague said, "The other day I was in a street-car when an apparent stranger sat beside me and spoke to me, introducing himself as my former patient. He had gained sixty pounds and made a complete recovery, having gone to another doctor." If there is anything in physical examination, this was a case of carcinoma of the stomach. The second case, which brought up the further history of this case, was one he had seen very frequently. All signs of carcinoma were present, and a large tumor almost half as large again as a fist was found in the pyloric region; there was great dilatation of the stomach. The patient went from bad to worse, and developed a projecting swelling beneath the anterior wall of abdomen. The mass broke and discharged through a fistulous opening through the skin, subsequently he practically recovered. There still remains a comparatively small tumor in the pyloric region and some gastric symptoms. He is living now, three years later. Of course it may have been localized peritonitis or a pancreatic tumor of some kind with rupture.

With regard to the case reported by Dr. Keen, a certain amount of scepticism is permissible as to the absolute diagnosis of the case. The diagnosis of a tubercular tumor of the stomach is one that ought not to be made lightly, but only after a very prolonged consideration, for, as far as he knew, there was no such case recorded. The occurrence of tubercular ulceration in the stomach with a certain amount of inflammatory reaction in the neighborhood is relatively not uncommon, although it is one of the rare diseases. The diagnosis, even from the pathological stand-point, is one that ought to be made with considerable reserve.

As far as the other possibilities are concerned, syphilis must be considered. To be sure, syphilis in the form of a tumor is the rarest possible condition in the stomach. There is only one case of syphilitic tumor of the stomach recorded. The case is that described in Cornil and Ranvier's "Hand-Book of Pathology:" A tumor of some size, with ulcerated interior and proliferative gastritis. Recently, within the last two or three years, Luxemburg and Zawadsky have described a case in a young man of what was supposed to be syphilitic ulceration, but in that case the diagnosis was made by microscopic appearances, which can scarcely be regarded as distinctive. The disappearance of syphilitic tumors is more common than the disappearance of tubercular tumors, although either may take place. The possibility of this being carcinoma, after all, is not to be overlooked. He had seen cases of carcinoma which had behaved just as Dr. Morton's, an interval of a long time occurring in which there was almost complete recovery of health. As to the case which he had already spoken of as to its improvement, he believed that was certainly one of carcinoma. Only two days ago he had been at an autopsy upon a case of carcinoma of the stomach and liver in which the liver was so large that the tip of the right lobe was lying in the true pelvis on the right side and the tumor occupied the whole of abdomen, except the lower left portion, and in which case there had been one of those curious intervals without symptoms. This patient had undoubtedly had carcinoma of stomach for some time, but seven weeks before this tumor had suddenly began to sprout out luxuriantly and grew with such remarkable rapidity that at each succeeding visit to the hospital he could see a change in the size of the enormous organ.

This case of Dr. Keen's is one which the future will throw more light upon. It is to be regretted at the present time that portions of the enlarged glands were not injected into animals. Pathologists are fairly uniform in holding at the present day that the diagnosis of tuberculosis without animal injection is a diagnosis that is open to a certain amount of question in the case of certain lesions.

Dr. Keen rejoined that he felt with Dr. Stengel that the diagnosis is not yet absolutely certain, nor is the cure absolutely assured. The title of his report reads, "Followed by apparently complete cure." But nine months have elapsed now since the operation and the doctor is in robust health and has resumed his practice. One cannot always, of course, be certain that there is no syphilitic infection. Even among members of the medical profession it may occur by accident. At the same time there was never the slightest suspicion of such infection nor the slightest treatment for syphilis. The clinical history also looks decidedly towards tuberculosis.

As to the diagnosis made by Dr. Kyle from the examination of the small gland, the size of the specimen was not sufficient to allow for any injections into animals, so that that method of diagnosis could not be employed. No examination by a test usual for hydrochloric acid had been made on account of the patient's extreme weakness, hæmorrhage, and the very precarious condition of the digestion.

The specimens will be sent to other pathologists and a later report made, both as to the diagnosis and the final result.

TRANSACTIONS OF THE PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, October 5, 1896.

CASES OF ABDOMINAL CYSTIC TUMOR IN THE MALE.

Dr. W. J. Hearn read a paper with the above title, for which see page 703.

Dr. H. R. Wharton said that he had not injected hydroceles for several years. He simply exposed the sac, cut out a small portion, and sutured the edge of the tunica vaginalis to the skin with catgut sutures and put in a little piece of gauze or protective. The cure seems to be radical, the patients have all gotten well, and there has been no constitutional disturbance. This is simply the revival of an old operation with aseptic precautions. He had never been troubled with severe sloughing, but it was very important that great care should be exercised as regards asepsis, for if the sac becomes inflamed serious complications may follow. With regard to bilocular hydrocele in which the liquids in the two sacs were different, he had seen several such cases. The turbid fluid probably contained spermatic elements. He thought these multiple hydroceles were apt to be spermatoceles, at any rate one of the sacs is apt to contain spermatic elements. He operated recently on a case of that kind by incision, and stitching the sac to the skin which did well. In this case an examination of the fluid showed it to be teeming with spermatic elements. He was inclined to think that it would be safer in almost every case of hydrocele to make an examination of the fluid before operation. He did not know that spermatoceles were operated on with any especial danger, although they used to be considered unfavorable for injection, for testicular complication used to follow injections in these cases, while such complications were extremely rare in cases of ordinary hydrocele treated by injections.

OPEN MEASURES IN THE TREATMENT OF SO-CALLED SIMPLE AND COMPOUND FRACTURE.

Dr. O. H. Allis read a paper with the above title, for which see page 698.

Dr. W. J. Hearn said that a simple fracture may not be so simple after all, as in the case of a boy recently under his care who had fallen and sustained a fracture of the femur, the bone almost penetrating the skin. Dr. Allis was with him ; they opened it up and made a compound fracture of it. It was a good thing that this was done, for otherwise they could never have gotten union. A few months since he had a case of fracture of the clavicle which he could not keep in position. He converted it into a compound fracture, and then found that the cause of the trouble was that a piece of the clavicle had broken off and had become interposed between the ends of the main fragments. He wired the fragments together and union with very little deformity resulted. He had frequently treated such cases in this way and had had very little deformity. He made an incision below the clavicle and lifted up the flap. It was a very easy operation and any novice could do it. He had employed silver wire and had had no bad results. In an article recently on fracture of the clavicle a case was mentioned where a hæmatoma had formed over the clavicle. The surgeon opened the hæmatoma and the patient expired. It was apparently a simple fracture, but the fragment had evidently penetrated a vein, through the opening in which air had entered causing death.

Dr. Thomas R. Neilson agreed with Dr. Allis in the suggestion that unfortunate results may occur from confusing the terms "simple" and "compound." All who have had much hospital experience have seen cases of so-called simple fracture, where interference for the better apposition of the fragments was necessary, and sometimes imperative in order to obtain reduction at all. He had had several such cases, and had opened them fearlessly. In such cases the procedure is not only indicated but demanded. A surgeon would hardly be justified in leaving a case of fracture in bad apposition, when he could get perfect apposition if he were to open the parts. He always pursued the course which Dr. Allis had suggested in handling compound fractures,—viz., open freely and effect perfect apposition, if necessary, by mechanical means, after which he applied a fixed dressing without too close apposition of the wound.

Dr. H. R. Wharton emphasized the statement of Dr. Allis that simple fractures are often complicated. He had often, after amputations, examined simple fractures in the amputated parts and had been surprised to see the extensive comminution of the bone or the extensive laceration of the soft parts. Since he had been wiring and making primary fixation in compound fractures he had been impressed by the amount of damage to the bone and soft parts that results from fracture. On the surface there may be only a small wound, but when the parts are laid open extensive laceration is found. From his experience with ununited fractures he believed that almost all cases of non-union result from muscle or fascia being interposed between the fragments of the bone, and that improper dressings had very little to do with non-union in fractures. With regard to primary fixation in simple fractures he believed the time would come when surgeons would interfere with simple fractures more freely. In cases of simple fracture with extensive laceration of the soft parts, he considered the safest procedure to be to make a clean incision. As to the nomenclature of fractures, it is hard to change the present names. The terms "open" and "closed" fractures express the conditions very well and are good terms. With regard to wiring simple fractures this may be required where it is impossible to keep the fragment in apposition. He had recently wired a simple fracture of the clavicle where this condition existed, with good result.

Dr. John B. Roberts said that some time ago he suggested that the terms "open" and "closed" be used in the description of fractures. There are certain so-called simple fractures that should be opened. He had dwelt upon this subject four or five years ago in connection with fractures of the lower end of the humerus and before that time in relation to fractures of the scalp. He would not cut down upon many simple fractures, but there are some in which he would do so. There is a certain definite class of cases of closed fracture and of open fracture where it would be necessary to cut down for purposes of exploration, and it depends upon the time that the surgeon sees the fracture and the changes that have taken place in the fracture itself as to the propriety of the procedure.

There are a few cases of dislocation which should be treated in this same way. He had had several cases of unreduced dislocation that would have done far better had he cut down upon them, instead of making vigorous efforts to reduce. Mr. Lane, of London, has lately written upon the subject of the open treatment of fractures of the lower end of the tibia.

DR. J. M. BARTON said that where deformity exists that cannot be otherwise corrected he saw no objections to opening a simple fracture, provided the operation be done where reliable antiseptic precautions could be secured.

He had been in the habit of opening simple fractures of the patella for the last nine years, as he did not consider those produced by muscular contraction could be put in good position without. Much less would he hesitate to cut down on the shaft of a bone, where no great joint is exposed to infection.

One objection to making all fractures compound, as Dr. Allis suggests, is that the ambulant method of treatment could not so often be used. He had recently made a slight modification of the ambulant dressing to which he desired to call the attention of the Academy.

It has been found that the plaster of Paris of which the ambulant dressing is composed soon breaks even when strengthened by tin strips. The breaking is often due to the patient bearing his weight on the toe portion of the splint in the last half of his step, the foot portion of the splint acting as a lever tending to break the leg portion.

To remedy this difficulty it has been suggested to strongly flex the foot before putting on the plaster and to fix it in that position by the plaster, so the patient would walk on the heel alone, but, on trial, he had found this fixed, forced flexion soon to become unbearable. He had met the difficulty by putting a large wad of cotton, fully an inch and a half thick, under the heel alone after the usual inch of cotton had been placed under the entire foot. After the plaster has become firm over this, the patient is able to stump around, bearing all his weight, in all positions, on the heel alone, the toe end of the splint never coming in contact with the floor.

DR. L. W. STEINBACH thought that the use of the fluoroscope would be a valuable aid in determining the necessity of resorting to incision in the treatment of a fracture.

DR. JOHN B. DEAVER agreed with Dr. Allis as to the nomenclature. It struck him as being very important from a medico-legal stand-point, especially the words "infected" and "non-infected." The question of cutting down upon a simple fracture must be governed by the judgment of the individual surgeon. He did not think it is always advisable to make simple fractures of the patella compound and wire. A minimum amount of infection in the knee-joint is capable of setting up a maximum amount of trouble.

Stated Meeting, December 7, 1896.

A LEVER AND FULCRUM FOR TREPHINING.

Dr. W. Barton Hopkins presented an instrument in which were combined a lever and fulcrum for elevating depressed fragments of the bones of the skull, where, owing to large gaps, edges of sound bone are too far removed to act as a fulcrum for an ordinary lever, or where the fragments have been so firmly impacted in their new position that great force is required to elevate them.

The instruments are adaptable to a very wide range of conditions incident to depressed fractures. The foot of the lever can be inserted into a very small trephine opening, the fulcrum resting directly on the surface of sound bone. On the other hand, in such cases as have involved the removal of large portions of bone and a depression still exists at one point, the fulcrum will span the opening in any direction which will bring it at right angles to the axis in which the lever is desired to act. The relations of the fulcrum, weight, and power being always constant and the lever being one of great advantage, the power can be exerted with nice precision. The fulcrum is milled longitudinally to avoid tendency to lateral slipping, its upper surface a half cylinder forms a pivot for the groove in the lever allowing a play of about thirty degrees.

LONGITUDINAL FRACTURE OF THE LOWER END OF THE TIBIA WITH FRACTURE OF THE FIBULA.

Dr. De Forest Willard exhibited a patient who had sustained a comminuted fracture of the bones of the leg at the ankle seven months previous.

The patient is very seriously disabled, as the foot is everted in the position so frequently seen in Pott's fracture of the fibula. There is also great thickening and enlargement about the ankle-joint, preventing flexion even to a right angle and giving great pain after walking. The patient is totally disabled from following his occupation as a blacksmith.

A skiagraph reveals a most interesting condition. The fibula was broken about three inches above the ankle-joint and has united, overlapping one inch. Within the ankle-joint is a large fragment lying against the tibia, and the lower end of the tibia shows also a longitudinal fracture which evidently split off the portion of the tibia which articulates with the fibula. This fracture extended up the shaft of the tibia about two inches. The portion which articulated with the fibula has been carried backward and permits the foot to assume the position of partial posterior dislocation. The skiagraph also shows a mass of bone lying within the ankle-joint between the astragalus and the tibia, thus practically blocking normal flexion. Whether this is a portion of the tibia or whether there has been a fracture of the astragalus, or whether this mass is a growth of callus, can only be positively determined at the time of operation after the joint is opened.

Dr. G. G. Davis said Gosselin described a fracture more or less spiral in shape going into the ankle-joint. He himself had carefully looked for these fractures, but think they are extremely rare. Last year, however, at the German Hospital, he had a patient with a fracture of the fibula, but apparently no injury to the tibia. After a few days he had the resident put the limb in a fixed dressing. In ten days or so the patient complained of great pain, and on removing the dressing he found a protrusion at the ankle-joint next to the fibula,—that is to say, on the outer portion of the articulating surface of the tibia. It was a fracture going into the joint, chipping off the side of the articulating surface next to the fibula. He divided the tendo Achillis and pushed the fragment back. By keeping special watch it was kept in place. As the tendo Achillis pulled the foot up, in his case it turned the fragment out. In Dr. Willard's case the fractured tibia is displaced forward, and possibly the astragalus may also have been involved. The radiograph shows that the tibia is displaced considerably. Out of many cases of fracture of the tibia seen by him in the last four years he had only recognized one in which the fracture involved the ankle-joint.

OSTEOMA OF THE TIBIA.

Dr. Willard presented a patient with a large osteoma springing from the lateral face of the tibia at its upper extremity below the tubercle. It had been growing for seven years, but had not given severe pain until recently, when the patient was injured by falling on a railroad track.

The exostosis extended in the direction of the opposite leg into the belly of the gastrocnemius and soleus, and had caused absorption of their fibres. The superficial portion of the growth lay almost be-

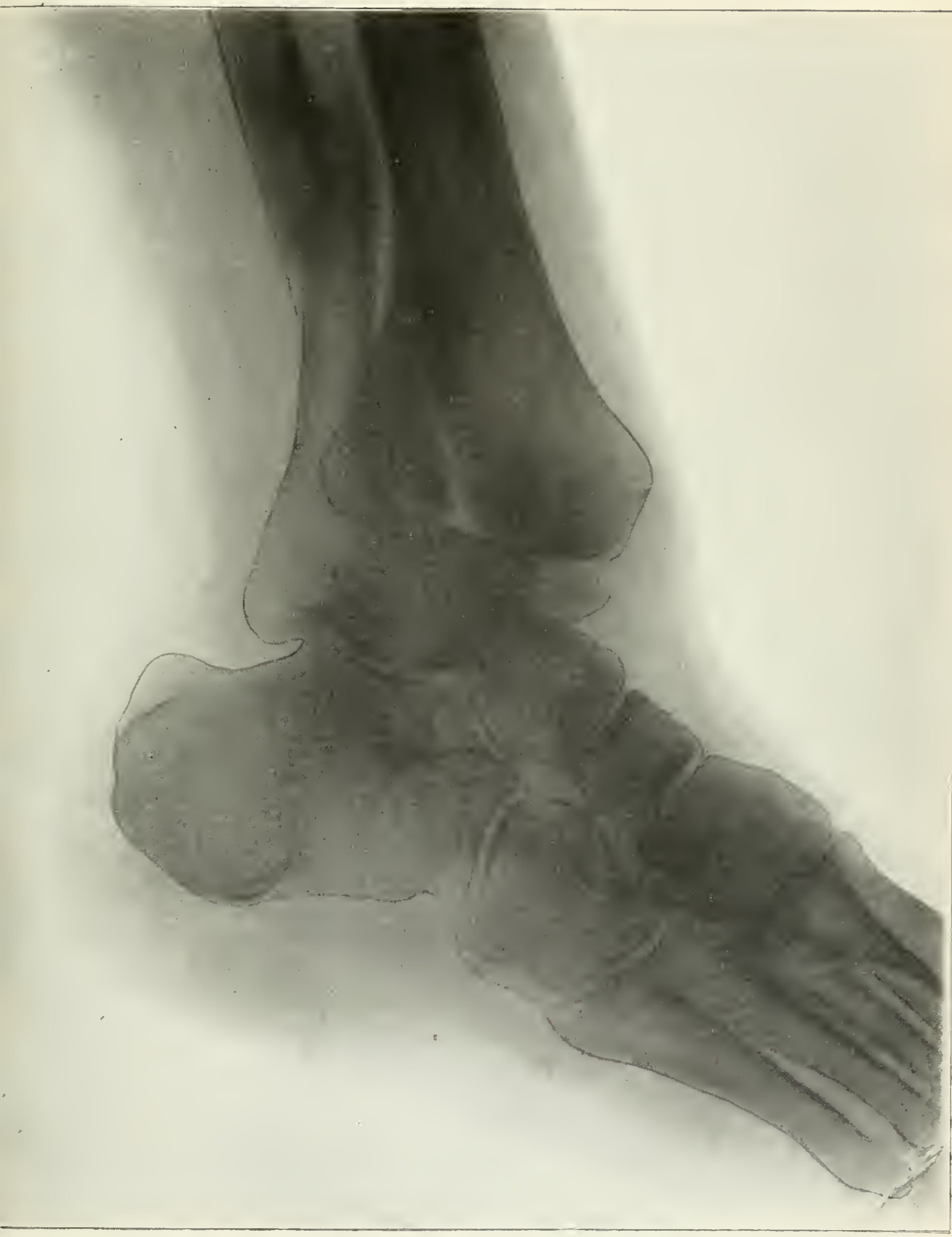


FIG. 1.—Longitudinal fracture of tibia; also fracture of malleolus and fracture of fibula. Skiagraph.

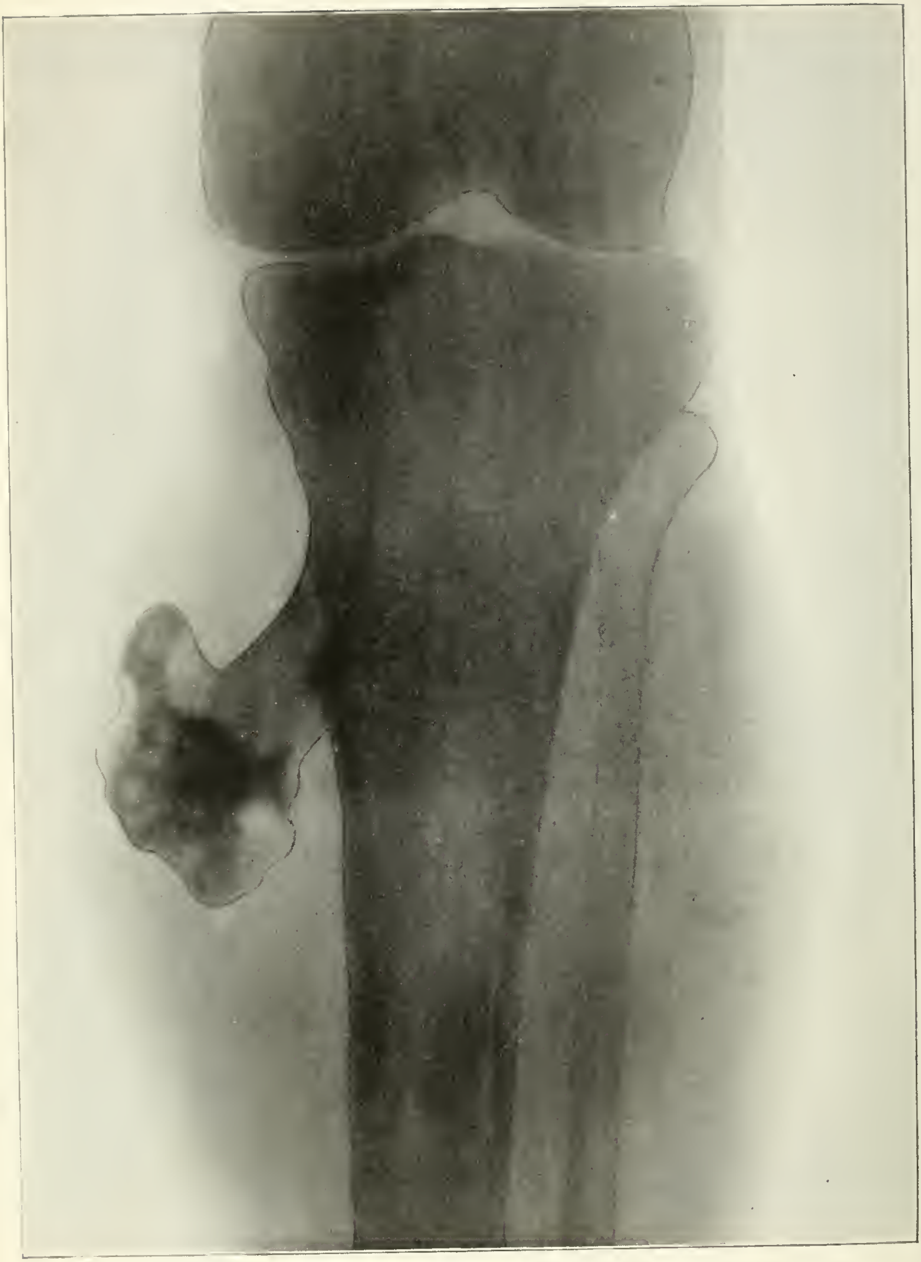


FIG. 2.—Osteoma of the tibia.

neath the skin. The pain was so severe from nerve pressure that it caused almost complete disability, and the man was compelled to walk upon crutches. The patient was not cognizant of any direct injury at the period of development, but he had been subjected to several concussions and had broken the astragalus upon the same side.

A skiagraph showed that the growth originated from the lateral face of the tibia nearly at its upper end; that it was in shape like a door-knob with pedicle and projecting double nodule. It had been removed by chisel.

URANOPLASTY.

Dr. J. Ewing Mears showed a case operated on for cleft of the hard and soft palate to illustrate the method now employed by him in this operation. The patient, a little girl, was six years of age when the first operation was done, in October, 1895. The cleft of the hard palate extended through the horizontal plate of the palate bone and slightly into the palatine process of the superior maxillary. Instead of attempting at one operation to close both clefts, he closed simply the cleft in the soft and allowed the interval of a year to elapse before closing the hard. In children he allows a year because the bones are growing, and he finds the opening in the cleft contracts to a very material extent, just as is seen in cases of hare-lip, where a cleft in the alveolar process coexists. For closing the cleft in hard palates he employs Ferguson's method, making section of the bone with a chisel or with the saw and then drawing the two segments over into the median line, the sutures being fastened with shot and leaving a gap on each side. Before this is done the edges of the opening are freshened and the sutures are introduced. The openings thus formed are packed with 5-per-cent. iodoform gauze, and as this packing is changed it is gradually reduced in quantity until closure is effected, which occurs in about ten days or two weeks. The closure of these openings usually takes longer in adults than in children. He had never had such an accident occur as to have the opening remain after making a section through the bone. In adults he does operation in the same manner, closing the cleft in the soft palate first and following with the second operation after about four weeks, endeavoring at the first operation to get the segments into line if any irregularity exists. Where there is an attachment of the vomer to the palatine process he chisels it loose in order to free the edges, so that when the next operation is done there can be no difficulty in bringing the segments into the median line. In this operation the effort is made to accomplish the improvement of deglutition, so that food will pass naturally into the pharynx, and to improve articulation. The results vary considerably in each case as they depend a good deal upon the structure and conformation of the parts. He has had some cases in which articulation was almost, if not quite, perfect, but in the majority of them there is more or less difficulty in articulation, although in children, by education and care, this may be considerably improved. One of the good results accomplished is the moral effect upon the child. Many children who suffer from cleft palate are timid and suffer considerably from being teased by their playmates, and the relief afforded by the operation removes this condition.

As to the etiology of cleft palate, Dr. Mears said that while possibly maternal impressions may have something to do with the occurrence of the deformity, yet he thought it might be accepted that it is caused by defective nutrition during intrauterine existence. He had gotten the family histories as thoroughly as possible in his cases. and had generally found that the mothers, when pregnant, were not in a state of health which would give the fœtus the nourishment which it should have. He referred to experiments which had been made in Dublin in the Zoological Garden under the care of Professor Cunningham. Before the experiments were undertaken, lion whelps born in the garden would invariably have cleft palate, and as a result they could not take nourishment and died. The subject was taken up, and it was found that by taking care of the nourishment of the mother during the time she was carrying the young, giving her crushed bones and food containing phosphates and other elements of bone, it was possible to overcome this, and the whelps after that were all normal. The director of the Zoological Garden of Philadelphia had told him the same thing. He also had informed him that it was a matter of observation that among the lions of travelling circuses this condition did not occur, and he attributed it to the fact that the animals had more air and were fed on food containing more of the elements of bone.

Dr. G. G. Davis said that, as regards operating in two stages, he thought that in a considerable number of cases one was sufficient. If the operation is not entirely successful, the opening left is usually so small that applications of silver nitrate will close it, wherefore he would not ordinarily consider it necessary to divide the operation into two parts, although it may be desirable in dealing with large clefts. He did not think obturators were ever necessary, nor that there were many clefts so wide that they could not be closed by operative measures. No one can universally achieve success at the first trial, sometimes the best of operators fail. These failures are fewer as one's experience increases, and many clefts, even though extending from the teeth back through the soft palate, can be closed in a single operation.

Dr. De F. Willard said that in his experience small openings that remain after unsuccessful operations upon the hard palate will often close subsequently, especially if they are stimulated with iodine, etc. If good union is secured in the soft palate a second operation will, in ordinary cases, accomplish much towards narrowing or closing the opening in the roof.

Dr. Mears rejoined, saying that he had come to this method of operating after twenty years of trial and many experiences. At first he had ambition to do as has been suggested, but his results were not satisfactory. With regard to doing the operation at one sitting, if the cleft extends through the entire hard palate, a section through the hard palate interferes very seriously with the blood-supply, as the arteries which run along the base of the alveolar process send branches across the hard palate, and in making this section they are divided. In some instances the nutrition was so much interfered with that necrosis followed. For this reason, and for the reason that the operation is sometimes very tedious and quite a strain on some patients, he had found it desirable to do the operation in two stages.

As to the anæsthetic, he used chloroform and ether,—one-third of the former to two-thirds of the latter,—finding this mixture to give prompter anæsthetic effects and less secretion from the mucous membranes. He had never had any unpleasant results following the use of this mixture.

As to cutting or stretching the pillars of the fauces, he did that when he found that they were tense and that they drew the palate down. He sometimes cut the muscles, but did not do so until the palate became stretched by use. Success in articulation depends largely upon the conformation of the pharynx, which differs in each individual. In some cases there is a large pharynx, while in others there is a very narrow, constricted one, and in these the soft palate can come in contact with the posterior wall. This is the normal condition, the soft palate coming into contact with the posterior wall of the pharynx.

EDITORIAL ARTICLES.

THE RELATIONS EXISTING BETWEEN GRANULATION TISSUE OF REPAIR, THE INFECTIVE GRANULOMATA, AND THE SARCOMATA.

The formation of granulation tissue is one of nature's most common answers to insults directed against the animal body. This being so, the importance of a clear conception as to what granulation tissue is and how it may be modified is self-evident.

The most commonly studied example of granulation tissue is that found in a wound healing by second intention. As it is the object of this article to study granulation tissue under various circumstances and influences, a knowledge of a type is essential, and one may conveniently choose the healing of a wound by second intention as that type. If a wound is made and left gaping but protected from infection and mechanical irritation, we find that, after a very short time, its surface becomes glazed, owing to effusion and coagulation of plastic lymph mixed with blood. After a few days this is thrown off and the individual structures which could at first be clearly distinguished forming the floor of the wound are no longer recognizable. The surface is now covered by a velvety clothing of soft red buds or granulations, which bleed readily on being disturbed, and from which is thrown off more or less purulent material, which varies in amount according to the success of the means taken to avoid irritation. The minute structure of the granulations is simple. Around loops of minute blood-vessels which push themselves up from below are congregated numerous cells. These cells are of two varieties,—viz., leucocytes and fibroblasts. The former are smaller than the latter, and play a double *rôle*, being at the same time scavengers and purveyors of food to the fibroblasts. The fibroblasts generally contain one large, easily-stained nucleus, and from their general resemblance to epithelium they are often named epithelioid cells. They are derived from the fixed tissues in the neighborhood of the wound, are embryonic in character, and engaged in active proliferation. After a short time the most deeply-seated fibroblasts elongate and assume a spindle shape. As healing progresses the bodies of these spindles either split up to form fibrous material on which their nucleus remains as a connective-tissue corpuscle, or they secrete protoplasmic material which forms the fibres.

The embryonic material here described as typical, if uninfluenced by noxious agencies, advances in development through the stage of spindle-cells to that of mature connective tissue. In such granulation tissue the abundant supply of blood-vessels and the shape of the buds or granulations are merely accidental though useful accompaniments. The essential element is the epithelioid, the embryonic cell, capable of self-reproduction, of amœboid movements, and under proper conditions of development. The leucocytes always present serve as food and act as scavengers. Under proper conditions only sufficient new material is formed to repair the losses which the body has sustained.

From this type, arbitrarily selected, the variations are numerous, variations in quantity, quality, and arrangement of the cellular elements, according to the influences, favorable or unfavorable, which induce the formation of granulation tissue or act on it when it is formed.

Undoubtedly the most favorable condition in which granulation tissue is ever formed is in the healing of an aseptic wound by first intention. A clean cut wound is made, kept clean and unirritated, and bleeding is stopped. The walls of the wound are brought together, leaving as few unapproximated places as is possible, and the skin is closed. What happens? The mechanical insult producing the wound has killed certain small portions of the tissues, and the parts in the immediate neighborhood resent it. The blood-vessels dilate, lymph exudes, mixes with the small amount of blood necessarily unremoved from the wound, and by coagulation temporarily unites the two surfaces and fills up any little spaces which would otherwise be empty. The fixed tissue cells beside the incision return to embryonic form and proliferate, forming numbers of round nucleated cells (epithelioid cells). These cells invade the plastic lymph until those from one side mingle with those from the other side of the wound. Soon the round cells elongate, and as early as the sixth day there are far more spindle than epithelioid cells. From spindle-shaped cells to mature fibrous tissue the transition is as easy, though slower, and the wound is then firmly healed.

Not only do the embryonic cells invade the plastic lymph, but numerous capillaries make their way into it either accompanying the epithelioid cells or carrying them with them. Whenever the coagulated lymph has served its purpose, of temporarily uniting the wounded surfaces and of forming a framework into which the embryonic tissue may grow, it breaks up and is removed. Here the leucocytes play an important *rôle* as scavengers. Along with the plastic lymph or before it any of the fixed tissues which may have died are disintegrated and carried off. This process of healing is essentially the same as healing by second intention, the only difference being that in the former there is much less work to be done, and hence far less granulation tissue is formed.

Wounds treated aseptically are said to heal more rapidly than those treated antiseptically. This can be readily believed when we remember that irritating antiseptics are bound to kill or reduce the activity of tissue elements, and hence produce more material to be broken up and removed, while at the same time they weaken the cells destined to form granulation tissue at the very time their activity is most desirable.

Macewen some years ago described a treatment for otherwise inoperable cases of aneurism. He passes needles through the wall of the diseased vessel, allowing their points to impinge against the opposite wall, there producing an irritation. A white blood-clot is formed and adheres to the vessel wall. This clot is essentially the same as the effused lymph seen in a wound healing by first intention. The irritation of the intima must necessarily produce an active growth of the connective-tissue cells (endothelium) of which it is composed, if not also of those of the deeper structures. The new-formed cells are fibroblasts or epithelioid cells, and penetrate the white blood-clot in which they proceed to develop. When their development has sufficiently progressed the scaffolding of white blood-clot is broken up and removed, leaving the arterial wall thickened by a new formation of true scar-tissue. In this case the clot is merely the scaffolding by the aid of which the permanent structure becomes possible, but the *essential* in the process is the formation of granulation tissue and its development. The healing process here is the same as healing by first intention, except that here there is more material to be "organized," and only one side of this material is in contact with the surface from which the embryonic materials necessary for organization are derived.

The organization of foreign bodies has been thoroughly studied by many observers. The method of organization seems to be much as follows: The implanted foreign material, whether animal or vegetable, causes more or less irritation, and the surrounding tissues respond to the insult. Lymph and leucocytes soak or wander into the foreign body. The fixed tissue cells in the neighborhood become embryonic, proliferate, and follow the lymph and leucocytes. If all goes well these embryonic structures develop, and the foreign body, after acting as a framework supporting the granulation tissue, is absorbed in the same way as the coagulated lymph is absorbed in a wound healing by first intention after it has ceased to be of service. In reality the word "organization" is out of place. The foreign body does not become organized, it is gradually absorbed, granulation tissue taking its place. Examples of this process are seen in the organization of Hamilton's sponge-grafts, of Senn's decalcified bone-chips, of moist blood-clot, etc. This process is identical with that of healing by first intention, except that in the former the character and amount of the framework to be ultimately removed is different from what is found in the latter.

All the forms of granulation tissue which we have discussed so far are *under favorable conditions*, and are merely nature's answer to mechanical insults. In all these the new-formed tissues advance to their natural developmental end if the favorable conditions are continued. We must now pass on to the next part of our subject, a part of enormous importance, and consider the development and behavior of granulation tissue *under unfavorable conditions*.

For convenience, it may be well to divide the many possible unfavorable conditions into two classes: (1) mechanical and perhaps chemical; (2) organic.

(1) A wound which under favorable conditions would heal with rapidity by the formation and development of more or less granulation tissue, when irritated refuses to heal. A common form of irritation is that produced by want of rest. Chemical irritants have the same effect. Under these conditions (irritation, mechanical or chemical) even, should the wound be kept aseptic, healing does not take place. Nature, indeed, forms granulation tissue, but owing to the noxious influences present the embryonic tissues do not develop into the adult state, they degenerate and are thrown off.

In the vast majority of cases such wounds are infected by pyogenic organisms, but this infection is not necessary for the degeneration of the granulation tissue. Let the sharp edge of a decayed tooth irritate the cheek and the result is an ulcer. This ulcer is certainly infected, and as certainly do the infecting organisms play a part in the process. We may treat the ulcer with all the antiseptics in the pharmacopœia, but the ulcer remains. As soon as the irritating sharp edge of tooth is filed off or removed, healing begins, even if no special attention be paid to cleanliness. The old story of the Italian beggars producing and perpetuating ulcers on their legs by the use of chemical irritants is another example of the same thing. In both these examples ulceration is produced, granulation tissue is formed and degenerates by the constant or repeated application of mechanical or chemical irritation; in both pyogenic organisms are present in abundance, but are non-essential, as in both a cure can be accomplished by removal of the non-living irritant. Where granulation tissue is formed and degenerates under the influence of mechanical or chemical irritation, it must be remembered that the resulting ulceration is strictly limited to the neighborhood of the application of the irritant; if the ulceration spreads beyond these limits this spread is due to the presence of a self-reproductive agent,—that is, to a living infection.

The unfavorable conditions of mechanical or chemical origin which affect the development of granulation tissue and lead, for example, to ulceration are comparatively unimportant, except in one respect,—namely, that they cause a localized lowering of the power, which the tissues normally possess, of resisting the action of living organisms. They give rise to a *locus minoris resistentiæ.*

(2) Organic unfavorable conditions are of two classes, one personal to the individual, the other introduced into the individual from the outside,—viz., organic infection. Under the head unfavorable conditions personal in character are included constitutional or local peculiarities which may interfere with the proper development of granulation tissue when formed, or act as means of lowering resistance to bacterial action. A good example of this class of unfavorable conditions is the presence of varicose veins in the leg. Here the tissues are œdematous on account of the venous stasis. Dropsical tissues are notoriously non-resistant to evil influences. A bruise, scratch, or blister which under normal circumstances would heal at once becomes infected. The efforts of nature to resist infection are unavailing. An ulcer forms and increases in size. Nature's method of resisting local infection is by the formation of granulation tissue, but here the tissues are too dropsical to respond efficiently. Any granulation tissue which may be formed is feeble and readily degenerates. If in such a case we assist nature by doing away with the venous stasis, granulation tissue is formed abundantly, and the ulcer soon heals, exactly in the same manner as a wound healing by second

intention. The local antiseptic treatment of these ulcers, while important, is of little avail if the other noxious influences at work are not removed. Any general lowering of the health acts unfavorably upon the formation and history of granulation tissue. Among the personal unfavorable conditions, a most notable example is that state known as the scrofulous diathesis. Here the patients, most commonly children, present very marked peculiarities belonging to two types. In the one type the children are graceful with transparent skins; in the other, they are stout and clumsy with pasty skins and thick upper lips. Both are similar in that the children are liable to repeated attacks of tonsillitis with transient adenitis, to eczema, to phlyctenular conjunctivitis, and to many other forms of peripheral inflammation. This condition is *not* tuberculosis, but is a personal condition of non-resistance to noxious influences of which the tubercle bacillus is one of the most important.

Organic Infection as an Unfavorable Influence on the Production and Life-History of Granulation Tissue.—In ordinary pyogenic inflammation the vascular phenomena are so marked that they are liable to lead the attention away from the changes occurring in the fixed tissues. If the infection is not very severe the infective material (or its ptomaines) destroys a small amount of tissue; around this as a focus the blood-vessels dilate, blood plasma escapes, and with it leucocytes, so that the necrosed area becomes soaked with lymph and permeated and surrounded by leucocytes. Those leucocytes which penetrate too far into the infective zone perish. Besides these vascular phenomena elicited by the irritation of the infective agent the surrounding fixed tissues resent the insult and become embryonic in character; become, in fact, granulation tissue. If the poison is stronger than the resisting power of the part of the body attacked, then the granulation tissue formed is of trifling amount or degenerates as it is formed. If, on the other hand, the body is successful in its fight, the granulation tissue increases in quantity, penetrates the necrotic focus, and there develops in exactly the same way that it does in such foreign bodies as sponge-grafts. The most important diseases of granulation tissue are those known as the *infective granulomata*, and to the study of some of these we will now apply ourselves.

(I) *Tuberculosis.*—Tubercle bacilli, having gained entrance to and found "an abiding place" in the body, immediately become a source of irritation. As usual when insulted the surrounding tissues become embryonic in character and devote their energies to the reproduction of their species. For example, the connective-tissue corpuscle no longer forms those fibres of protoplasm which are characteristic of mature connective tissue ; it merely divides and out of one round cell forms two, these two, in their turn, taking up the work of division. Thus in a short time a little mass of round cells is formed, indistinguishable as far as the cells are concerned from the cellular elements of a round-cell sarcoma or of the very early stages of a wound healing by granulation. These cells are named epithelioid cells, and may arise from any of the mesoblastic fixed tissue cells. Some of the epithelioid cells, generally towards the centre of the mass, enlarge, become multinucleated, and often throw out branches or fine filaments as a reticulum among the embryonic cells. These are the giant-cells which are also found in certain sarcomata and in normal granulation tissue. In origin they are undoubtedly overfed epithelioid cells. While generally present in tubercular tissue giant-cells are non-essential, because not only are they *not always* present in tuberculous nodules, but, as already mentioned, they occur in other masses of granulation tissue which are not tuberculous.

The description given here of the histogenesis of tuberculous tissue is that held by the majority of observers and coincides with the observations of the writer, but it is only right to note that many careful investigators hold a different opinion. Metschnikoff, Le Dentu, Borrel, and others consider that all the elements of the tuberculous nodule are derived directly from the leucocytes. The epithelioid cells, according to them, are mononucleated leucocytes ; the giant-cells are the result of the fusion of several leucocytes.

Tuberculous tissue does not always arrange itself in nodules, but is often found in long-drawn-out masses or streaks, to which Watson Cheyne has given the name of "tubercular infiltration." This form is very common either alone or more generally accompanying nodules. The irritation produced by the bacilli is not necessarily confined to their immediate vicinity. Some of the more diffusible bacillary products may cause a formation of granulation tissue not necessarily infected by the bacilli themselves. In chronic tuberculous lesions large masses of this tissue may be formed and show but little tendency to develop. While the tubercles themselves are non-vascular, the masses of granulation tissue just spoken of, surrounding them, are well supplied with blood-vessels. These vessels often undergo changes. The intima becomes thickened and fibrous, markedly diminishing the lumen of the vessel. The adventitia shows similar changes. Ziegler names this process "hyperplastic arteritis." The hyperplastic arteritis probably has an important influence on the degeneration of tuberculous foci.

(1) *Terminations and Degenerations of Tuberculous Lesions.*—The disease tuberculosis is not incurable. In the bodies of those who have succumbed to general tuberculosis it is quite common to find that certain old lesions have been cured, although the general disease has been the cause of death. These may be termed cases of local recovery. In the post-mortem room it is exceedingly common to find evidences of cured tuberculous lesions in subjects who have died from other diseases years after all clinical evidence of the former have disappeared. How do these recoveries take place? The tendency of all granulation tissue, when unimpeded by noxious agencies, is to the formation of fully-developed fibrous tissue. Even when the granulations are the result of the irritative action of tubercle bacilli, the irritation may not be powerful enough to prevent development. Under such circumstances various changes take place in the tubercle. The giant-cells break up, the nuclei as connective-tissue corpuscles remaining attached to portions of the cell protoplasm which form fibres. At the same time the epithelioid cells cease dividing and proceed to attain their normal ultimate condition of fully-developed

fibrous tissue. These changes in the epithelioid cells begin in the periphery of the tubercle. Thus, in the place of a mass of granulation tissue, a hard nodule of scar-tissue is formed and a local cure is reached. This process of sclerosis is not confined to the tuberculous foci, it much more readily takes place in the non-infected granulation tissue which may surround the focus. In bone this may be well observed. When the tuberculous process is active, granulation tissue penetrates the bone in all directions, causing absorption of the bone (osteoporosis); when the process becomes quiescent the peripheral granulation tissue develops, a condition of sclerosis supervenes, and we find a zone of bone, harder than normal, more or less completely encapsulating the focus of disease. A local cure in tuberculosis is generally due to the encapsulation of the focus of infected granulation tissue (even when caseated or calcified) by the development to maturity of the mildly-infected or non-infected granulation tissue formed around it. In other words, the irritation of a noxious influence has been sufficient to cause the formation of a mass of granulation tissue, but has not been sufficient to prevent the peripheral portions of that mass from reaching their natural developmental end,—mature tissue. In very small nodules, where the noxious influence has been particularly wanting in virulence, it is easily conceivable that the whole of the little mass of granulation tissue centrally and peripherally may advance to maturity, or that the central cells may undergo fatty degeneration, be absorbed, and be replaced by the more vigorous peripheral cells which then become fully developed.

(2) *Caseation.*—The influence of the bacilli and their ptomaines may be so powerful that, instead of developing, the granulations degenerate and undergo caseation. Owing to the bacillary influence, aided probably by lack of nourishment, the cells in the centre of a nodule become granular, their outline indistinct, and they break down into a somewhat hard, *dead* mass of granular *débris* and fine oil-globules. This mass undergoes further changes, chemical in nature. From the conversion of its albumens into oil, it softens, and the

result is a cavity full of liquid which Park has named pyoid material.

If the pyoid material is evacuated by nature or art, the cavity may be closed by fibrous contraction. Such collections of caseous material are dangerous in that they are frequently the starting-point of a general tubercular eruption. It is extremely difficult to find bacilli in pyoid material, the infectiousness of which is, therefore, probably due to the presence of spores which have greater powers of resisting unfavorable surroundings than the bacilli. When collections of pyoid material are not evacuated, the cheesy material is often absorbed and in its place various inorganic salts are deposited, resulting in the formation of a calcareous nodule. This process is known as calcification.

(3) *Hyaline Degeneration.*—Tuberculous nodules which have developed into fibrous tissue are liable to undergo hyaline degeneration. The fibres of the tissue become infiltrated with a transparent homogeneous substance which gives the tubercle a jelly-like appearance.

(4) *Suppuration.*—This has often been considered no true degeneration of a tuberculous focus, and it is undoubtedly most commonly due to secondary infection by ordinary pyogenic organisms. During the clinical investigation of Koch's tuberculin, it was found that pus was often produced by its hypodermic exhibition. Prudden[1] has shown that the dead bodies of tubercle bacilli have pyogenic properties. He mentions that "the tubercle bacillus is capable of either inducing changes in the walls of the smaller blood-vessels in its vicinity or of attracting leucocytes by chemotaxis, or both, in such a way as to produce the phenomena of an *exudative inflammation.* These exudates may be exactly similar to those induced by several well-known micro-organisms,—namely, serum, fibrin, and pus."

Thus we find that tuberculous lesions are mere masses of granulation tissue, the reply of nature to the irritation of a certain noxious influence; that if the noxious influence becomes weakened or disappears, the granulation tissue behaves in a manner similar to that found in a healing wound ; and that if the noxious influence remains active, various degenerative changes take place, depending largely, if not entirely, on the character of the noxious influence.

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[1] New York Medical Journal, July 7, 1894.

(II) *Syphilis.*—When a patient is inoculated with the virus of syphilis the tissues at the point of infection are stimulated to action and a small quantity of granulation tissue is formed. This consists of epithelioid cells around and among which are leucocytes. Frequently giant-cells are present. After a short time the continued action of the noxious influence, which caused the local proliferation of the tissue, or want of nourishment, from the massing together of many cells, causes the new formation to undergo degenerative changes. The less external irritation there is, the less marked is the degeneration. An ulcer with hard margins and base is the result. After the lapse of more time, those degenerated cells which are not thrown off in the discharge from the ulcer are absorbed, and cicatrization takes place from the development to maturity of the undegenerated granulation tissue. Among the later manifestations of syphilis, the formation of gummata are of extreme importance. As a result of the activity of the syphilitic virus local irritation is produced, and nature responds to the insult in the usual manner by the neighboring tissues becoming embryonic and active in reproduction. Thus granulation tissue is formed. The cells of this tissue are epithelioid cells, among which a few giant-cells may sometimes be found. As usual, leucocytes surround and penetrate the mass to a greater or less extent. Any intercellular substance which may be present is usually gelatinous or may be slightly fibrillated. The cells of the gumma early undergo fatty degeneration. The degeneration is largely due to want of nourishment, as the blood-vessels which run through the gumma soon become affected with endarteritis obliterans. Furthermore, the massing and packing of the cells together are certainly inimical to proper nutrition. Having become fatty the cells are converted into clusters of granular material (compound granular corpuscles of Hamilton). This granular material is absorbed. Thus loss of substance is found, and when the remaining granulation tissue develops and contracts the characteristic scars of syphilis are left. Often all fluid is absorbed from the degenerated nodule so that the cells already fatty become inspissated, while the surrounding cells which have escaped the degenerative processes proceed to their ultimate development and form a firm, fibrous capsule around the caseous focus.

Instead of the caseous tissue becoming inspissated it may become liquefied, an emulsion of gummatous tissue resulting, which often escapes externally. This process of breaking down often forms an ulcer which only heals after all the degenerated granulation tissue is thrown off. Gummata, especially when situated in bone and not much degenerated, are microscopically indistinguishable from sarcomata. In tuberculosis the granulation tissue was not merely found in tubercles, it was found to be capable of infiltrating other tissues, of occurring in long drawn-out streaks, so also is it with the syphilitic granulation tissue, we may and do have gummatous infiltration of various organs and tissues. Syphilis differs markedly from tuberculosis in that the tendency of the granulation tissue in the former to advance in development to maturity is much greater than in the latter. As a result of this peculiarity we find that when various organs are extensively infiltrated with gummatous material scar-tissue is formed in strings, contracts, and the contraction of many of these strings nips between them portions of healthy parenchyma causing atrophy of these organs (syphilitic cirrhosis).

Actinomycosis.—Actinomycosis, a disease common among cattle, and known by Western cowmen as "lumpy jaw," occasionally attacks man. Owing to the irritation of a fungus, the "*ray fungus*," small masses of granulation tissue are formed, by the coalescence of these huge tumors may be produced. The minute structure of a very recent actinomycotic nodule is somewhat as follows: Around a core of the radiating filaments of the fungus there are found a number of large cells with large nuclei. These are epithelioid cells and infiltrate the surrounding tissues. Giant-cells may also be present. Lying among the epithelioid cells are many leucocytes, which are also numerous in the adjacent structures. Many foci such as that described may be side by side and in their growth become joined together.

The granulation tissue thus formed invades all structures. When bone is affected the bony material is absorbed. Metastasis is common. Secondary infection by pus organisms is extremely common, and much of the new growth is thus destroyed, but the continued formation of granulation tissue persists. It is interesting to note that the iodides seem to act favorably in this disease, which in its histogenesis so closely resembles gummata. As the actinomycotic foci become older, the rosettes of fungus increase in size and stain a bright yellow with picro-carmine. The centre of the yellow masses presents an appearance as if made up of a multitude of minute dots, while the periphery generally has an appearance of fine radiating lines. Such old masses are calcareous. When sections are being cut, a grating sensation is communicated to the hand through the knife of the microtome or the edge of the blade may be injured.

It is common to find small hæmorrhages around the older masses of fungus. The granulation tissue, especially that lying remote from the fungus, is not wholly made up of typical epithelioid cells, but spindle-shaped cells are common. This may be considered an endeavor on the part of nature to effect a cure, and corresponds to what is seen in tuberculosis. To the naked eye a mass of actinomycotic granulation tissue would be indistinguishable from a sarcoma if it was not for the presence of the minute sago-grain-like masses of fungus scattered throughout it. When this disease is examined microscopically many portions are found presenting a structure identical with sarcoma. It is only by the examination of several "fields" that the diagnosis can be made. Of course, the recognition of the ray fungi renders mistake impossible.

Sarcoma.—In a healing wound we find the tissues in three stages of development: (*a*) round cells; (*b*) spindle cells; (*c*) fully-developed tissue. Corresponding to these stages of development we find classes of tumors. (Sarcomata, fibromata, lipomata, osteomata, etc.)

Sarcomata are tumors of mesoblastic origin, the tissue-elements of which are embryonic in character and show little or no disposition to reach maturity. These tumors have been classified as round-celled sarcomata, spindle-celled sarcomata, myeloid- or giant-celled sarcomata.

The cellular elements of a sarcoma are indistinguishable from those of any other granuloma, and even their relative arrangement may be such that a positive diagnosis of sarcoma may be impossible.

Delbet[1] relates a case in which an apparently typical osteosarcoma of the lower part of the femur was in part removed. Cornil examined the specimen and pronounced it a myeloid sarcoma. The hip was disarticulated; recovery; no recurrence. Cornil again studied the tumor, became doubtful as to his previous diagnosis, and finally found in it tubercle bacilli. The same author operated on a case supposed to be one of cold abscess in the deltoid region. Macroscopically the case was typical. Recurrence took place at once, and a huge tumor developed, ulcerated, and caused death. The tumor was a sarcoma. Esmarch reports cases of tumors repeatedly removed because of recurrence and diagnosed as sarcomata, in which a cure was ultimately effected by the use of the iodides. One may conclude with safety that the microscopic structure of sarcomata is identical with that of granulation tissue, but that these tumors possess more or less marked peculiarities of conduct. What are these peculiarities?

(1) Their cellular elements, while increasing rapidly in numbers, do not advance in development to maturity.

(2) The tumor elements invade neighboring tissues, substituting themselves for these tissues just as ordinary granulation tissue infiltrates and takes the place of aseptic dead grafts.

(3) The tumor elements can be transported to other localities and grow there, giving rise to metastatic growths of the same character as the primary tumor. This transportation is usually effected through the blood-vessels.

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[1] Traité de Chirurgie, 1, 626.

These peculiarities at once distinguish sarcomatous granulation tissue from the ordinary granulation tissue of repair, but they are also present in the infective granulomata. We have seen how tuberculous and actinomycomatous tissue invades and replaces neighboring structures not to the same extent as sarcoma, but in the same way. Any difference in this respect is one of degree not of kind.

In the case of the infective granulomata for metastasis to take place, it is *not* necessary for portions of the tumor itself to be conveyed to the new location. All that is required is that the living irritant (tubercle bacillus, etc.) be so transported, and that in its new location it finds a suitable pabulum for its development. In the case of sarcoma it has generally been assumed that the transportation of the sarcoma-cells themselves to a new location is necessary before secondary tumors can arise. Probably this is commonly the case, but is it a necessity?

In the case of carcinomata the idea of metastasis occurring without the actual transportation of epithelial cells is out of the question, but the tissues necessary for the formation of sarcomata are to be found practically everywhere, and all that is requisite is the transportation of a noxious influence capable of stimulating these tissues to rapid reproduction, of rendering them embryonic, and of keeping them in this condition.

In studying tuberculosis, we found that while the action of the tubercle bacillus was to render the tissues embryonic, yet there was a distinct tendency in parts of the lesions for the tissues to rise in the developmental scale, and in this manner a cure should be reached. In the case of sarcoma does any such tendency ever show itself? The answer to this must be affirmative. In very many sarcomata we find that portions of the tumor have developed into mature fibrous tissue, and not only so, but that specialized connective tissue is formed, —viz., cartilage and bone. This is surely an evidence that the organism is making an endeavor to overcome the noxious influence acting on it, and is being, to a slight degree, successful. Leaving out of account the melanotic and myeloid varieties, the order of malignancy of the sarcomata is approximately the following:

(1) Round-celled sarcoma,—*i.e.*, granulation tissue in its most embryonic form.

(2) Large spindle-celled sarcoma.

(3) Small spindle-celled sarcoma,—*i.e.*, granulation tissue which has advanced somewhat in development.

(4) Fibro-, osteo-, or chondrosarcoma,—*i.e.*, granulation tissue which in part shows a tendency to reach maturity.

The resemblance clinically and histologically between sarcomata and the infective granulomata is extremely close, so close that one feels compelled to conclude that there is a real relationship. All are composed of the same elements, the formation of which is ordinarily the answer of the fixed tissues to insult. All have a greater or less tendency to remain embryonic, and in individual cases of each this tendency varies,—*e.g.*, of two cases of tuberculosis one will tend to become cured by its connective tissue becoming mature, while the other will remain embryonic and spread. All are capable of producing metastatic foci. All whose life-history we thoroughly know are conceded to be caused by a living noxious influence in one case, a bacillus, in another, a fungus, and in one other case (syphilis), the existence of a microbe is assumed. The remaining tumor of granulation tissue—viz., the sarcoma—seems, from its history, to be as truly the result of a living noxious influence as any of the others. Probably not all the sarcomata are produced by the same kind of noxa. It would be very surprising if they were. It is by no means improbable that some sarcomata are the result of microbic infection, although no such thing has been proved; but the fact that the toxines of erysipelas have a profound effect on certain sarcomata (those not least advanced in development) and have no effect on others might possibly indicate this. Bacteria have been, of course, discovered in tumors, but no causal relationship has been established. Psorosperms have also been described, but so far have not been cultivated successfully.

Firket has been successful in inoculating rats with sarcoma taken (I believe) from man, and von Eiselberg has successfully transplanted a fibro-sarcoma from rat to rat.

The success, or want of success, in transplantation experiments only prove that the cellular elements in the graft either have or have not found in their new location the necessities for their continued existence, and hence these experiments are not of much apparent value.

In studying the clinical records of sarcoma and tuberculosis it is interesting to observe the proportion of cases in which a history of trauma is noted.[1]

	No. of Cases.	History of Trauma.	Per Cent.
Cases of tuberculosis of the knee in König's clinic[2] . .	720	146	20
" sarcoma collected by Wolff[3]	100	20	20
" tuberculosis in Albert's clinic[4]	740	54	7.2
" sarcoma collected by Liebe	42	3	7.2

This comparison between the two diseases, one of bacterial the other of unknown origin, is, to say the least, striking.

Cohnheim's theory of the origin of malignant tumors is based on the assumption that unused portions of the embryonic tissues remain in the adult (rests or remnants) and that occasionally these become active and form tumors. "Rests" undoubtedly do exist and do form tumors,—*e.g.*, branchial cysts, accessory thyroids, post-anal tumors, etc. In forming these tumors a tolerably successful attempt is made to reach maturity, and they are not primarily malignant, although they may become so. Why should it be assumed that the embryonic "rests" imprisoned in the adult have, in a haphazard way, the faculty of both increasing in quantity and reaching maturity on the one hand, and on the other hand, of increasing in quantity and remaining embryonic? To the writer it seems evident that for the "rests" to become active and malignant a *something* in the nature of a noxious influence is required just as an influence is necessary for the production of the granulation tissue of repair. Thus, if the writer's view of the doctrine of "rests" is correct, all that that doctrine explains is the occurrence in various parts of the body of a material which may perhaps be more easily stimulated to malignant growth than tissues which have reached maturity. It does not explain what that stimulation is.

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[1] Watson Cheyne finds a history of traumatism in 38 per cent. of his cases of tuberculosis, while Herbert Snow considers that in the great majority of cases of sarcomata such a history could be elicited.

[2] F. König, Der specielle Tuberculo der Knochen u. Gelenke, I.

[3] Dr. C. Löwenthal, Archiv für klinische Chirurgie, XLIX.

[4] Die Behandlung der Gelenkstub aus der Klinik Alberts, von Dr. Josef. Preindlsberger.

John Fairbairn Binnie.

INDEX TO SURGICAL PROGRESS.

BONES AND JOINTS.

I. Transplantation of the Spine of the Scapula for Absence of the Upper Half of the Humerus. By Dr. Bardenheuer (Cologne). This procedure was employed in two cases. The upper part of the shaft of the humerus had become necrosed as a result of osteomyelitis and had been removed. The spine was exposed by an incision from its base to the acromion, and the trapezius and the acromial and spinal portion of the deltoid stripped off. A second incision was made at right angles to the first along the posterior border of the deltoid to its insertion. The infra- and supraspinati having been stripped off, the spine was chiselled out of the body of the scapula with a portion of the glenoid fossa and the whole of the acromion. By dissection of the external rotators, the periosteum was made available and the bony flap introduced into it. Both ends of the bones were united with silver wire. Bony union not having been obtained at the end of six weeks, the sutures were replaced, and in four weeks more a satisfactory result was obtained. Case reported while still under treatment.

The operation was repeated in a lady after removal of the glenoid fossa and seven centimetres of the shaft of the humerus.

The spine was divided in its middle, and together with the acromion and a portion of the neck and the articular surface of the scapula implanted in the deficiency. The wound was completely healed at the end of four weeks.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXV Congress, 1896.

II. The Formation of Rice Bodies in Tuberculosis of Joints, Synovial Bursæ, and Tendon Sheaths. By Pro-

FESSOR EDWIN E. GOLDMANN (Freiburg). This article is mainly a detailed reply to the opponents of Professor Goldmann's view that the origin of rice bodies is to be sought for in changes of the synovial membrane proper. Much of the forty-page work is devoted to the refutation of the views of König and his pupil, Landow, the author denying that primary plastic exudation, in general, or specially for synovial membranes, is to be considered as a primary vital manifestation of the tubercle bacillus. Deposit of fibrin is, as a rule, a secondary phenomenon and independent of retrograde metamorphosis of the tubercle elements. It is also pointed out that the histological studies contained in König's monograph on "Tuberculosis of the Knee," if properly interpreted, are directly contradictory to König's views.

Goldmann raises three questions :

(1) Is the formation of rice bodies a constant manifestation of a tubercular disease?

(2) Do the rice bodies owe their origin to the destruction of cells?

(3) Does the presence of rice bodies indicate a special and, from the clinical stand-point, benign form of tuberculosis?

Which are answered as follows :

(1) Rice bodies are unquestionably of tubercular origin ; but it is also clearly established that they may appear in joints independently of any tubercular process.

(2) It can be affirmed that they do ; the rule is that the typical rice bodies in every way resemble the portions of the sac wall, which is the site of a fibrinoid degeneration ; as examinations of a purely chemical character, or by chemical microscopical staining reactions fail to indicate the slightest difference. Their morphology likewise shows no difference. The simultaneous occurrence of tubercle bacilli in the rice bodies and in the synovial membrane can only be explained by the theory of cellular degeneration.

(3) Tuberculosis characterized by the formation of rice bodies pursues a slower course than usual, occasions less disturbance of func-

tion, and is especially amenable to treatment. That this disease is a special form of tuberculosis, anatomically and clinically, would seem proven by the historical fact that not till the anatomical proof of its nature had been demonstrated was it held to be tuberculosis by the clinician.—*Beiträge zur klinische Chirurgie*, Band xv, Heft 3, p. 757.

CHARLES L. GIBSON (New York).

GENITO-URINARY ORGANS.

The Radical Treatment of Prolapsus Uteri in Aged Women. By ANDREW F. CURRIER, M.D. (New York). The question comprehends not only the treatment of the aged with their atrophic tissues, but those who are near the menopause, and even young women with whom prolapse is irremediable by ordinary measures.

The lesions in question are essentially connected with gestation, few cases occur in nulliparæ.

If, after the distention by parturition of all the tissues in the birth-canal, the subsequent contraction is deficient, and an excess of intra-abdominal pressure (as in straining, vomiting, falling) forces the uterus down upon the vagina, the resistance of the latter being greatly diminished, the vagina may evert like the finger of a glove, and the uterus, acting like a wedge, may follow the axis of the pelvis downward and outward until it is out of reach of the propelling force. The bladder and rectum are dragged downward in some cases, in others they are peeled away, and a loop of intestine may occupy the hernial pouch of the vagina.

The universal symptom with prolapsus is discomfort, from which the patient can never entirely rid herself. If the bladder and rectum have descended, the efficient emptying of these organs becomes impossible, and cathartics and diuretics are constantly required.

Numerous cases have been reported in which troublesome cystitis resulted, followed by lesions of the ureters and kidneys, the final termination being a fatal one. In other cases vesical calculi have formed. Hernia of the intestine may occur with the serious consequences which are possible with such an accident. Bruising and ulceration of the os uteri is very frequent, and is probably the foundation of malignant disease in some cases. Atresia of the uterus may result, with the formation of a tumor as the retained secretions accumulate ; œdema of the tissues, especially of the cervix, is also possible, with serious consequences.

Pessaries, cups, straps, and other mechanical devices are usually imperfect means of support. Many operative measures have been proposed, the complete occlusion of the entrance to the vagina, the formation of a septum dividing the vagina into two distinct tubes (Le Fort), various plastic operations (Braun, Hegar, Emmet, Martin, Schroeder), the amputation of the cervix, the shortening of the round ligaments (Alexander), encircling the vagina with buried wire sutures (Freund), the free use of the actual cautery (Byrne), the passage of ligatures through the uterus and vagina (Schücking), abdominal section, dragging the uterus back and securing it in the abdomen, and finally the method which is recommended by the writer and others,—the extirpation of the uterus *per vaginam* and the removal of a sufficiency of redundant vaginal tissue.

This operation has already given satisfaction in a considerable number of recorded cases. Its indications are as follows :

(1) Such a condition of the atrophic and hypertrophied tissues as would render firm union by plastic operations problematical.

(2) Disease of the uterus and adnexa which renders them a menace to life and health.

(3) A condition in which there is the maximum of discomfort, especially if the patient is prevented thereby from earning her living. Even extreme age is seldom a contraindication to the operation ; the writer's most satisfactory case was in a woman of seventy-one.

The technique of the operation is sometimes simple and easy, and sometimes very difficult, especially in those cases in which the dissection is troublesome, and the passive hæmorrhage obstinate. The risk of wounding the bladder and rectum is greater than in vaginal hysterectomy under the ordinary conditions, but one prepares deliberately for the risk. After the removal of the uterus the stumps of the broad ligaments should be stitched to the vagina to favor the retraction of the latter. Redundant tissue may be removed from the vagina when the uterus is removed, or subsequently, according to the indications.

The shock of the operation is usually inconsiderable, and the mortality should be *nil*, except in cases in which there are peculiar and unlooked-for complications.

Five cases have occurred in the past two years in the writer's practice; one was fatal, but in that case serious disease of the kidneys was probable; an autopsy could not be secured.

In the other cases the results have been satisfactory, so far as has been ascertained. The method is recommended with confidence when compared with all other measures for the relief of prolapsus uteri.—*Author's Abstract.*

REVIEWS OF BOOKS.

A Text-Book of Genito-Urinary Surgery and Venereal Diseases. By J. William White, M.D., and Edward Martin, M.D. 8vo, pp. 1081. Philadelphia: J. B. Lippincott Company, 1897.

The aim of this work, as stated by the author in the preface, is to supply to general practitioners and students such knowledge of the subjects of which it treats as shall be of practical use to them, and this end has been attained in a way that is worthy of their high repute. It is to be noted with satisfaction that, unlike some other works of similar character, this one covers the ground which its title announces.

The various subjects are concisely treated, and the reader's attention is not drawn away from the more essential and well-established parts by the presentation of conflicting views or theoretical discussions. The introduction of the chapters on syphilis in the middle of those which treat of genito-urinary diseases, in such a way as to break their natural sequence, mars what would otherwise be an excellent arrangement of the work.

The first two chapters deal with the diseases of the penis and the urethra, each being introduced by an anatomical sketch of the parts, the latter in both instances would gain much, especially for students, if more fully illustrated. But for this lack, they are good. The second chapter includes a number of plastic operations, and their operative treatment, the steps of which are well described and illustrated.

It concludes with a short reference to the endoscope and its use, the importance of which in the treatment of chronic cystitis might have been more fully impressed.

Gonorrhœa and its complications are considered in the three succeeding chapters. The treatment of acute gonorrhœa by antiseptic irrigation is accorded the first place, but the writers do not concede the almost invariable measure of success claimed for it by its more enthusiastic advocates, in which view they are in accord with most specialists.

The chapter on stricture is full and satisfactory, the writers, while giving credit to Otis for his valuable work in connection with the subject, do not accept the more extreme part of his teaching with regard to strictures of wide calibre or the permanent cure of stricture by internal urethrotomy. They adopt also Thompson's view as to the situation of strictures, which is opposed to that of Otis. It is satisfactory to note the denial of the causation of stricture by masturbation.

The chapters eight to fourteen are devoted to chancroid-syphilis and its treatment; they are well illustrated and include thorough, though short, descriptions of the disease as it affects special organs and tissues, and also its hereditary form.

The diseases of the urinary tract are resumed with the consideration of the injuries and diseases of the bladder, and a comparative study of certain symptoms which are common to several urinary organs, such as painful and frequent urination, hæmaturia, and-so-forth. This is one of the most interesting chapters in the book. Next follows an excellent description of the manner of making examinations of urine, and the significance of its character in connection with certain diseases. The methods of examining for gonococci, tubercle, and colon bacilli are also given. The reference to cancer of the urethra is rather scant in view of the recent carefully reported cases, to the number of thirty or more.

The remainder of the work deals with the important subjects of vesical calculus, prostatic hypertrophy, diseases of the kidneys, testicles, and scrotum, and functional nervous disorders. These maintain the same standard of excellence that is shown in the preceding parts of the work, of the detail of which enough has been said to indicate the character of the whole, which is such as to give it a useful place among other works of a similar nature.

FRANCIS S. WATSON.

CHIRURGIE DE LA FACE. By Professor FÉLIX TERRIER, University of Paris, and Drs. GUILLEMAIN and A. MALHERBE. 12mo, pp. 303. Illustrated. Paris: Félix Alcan, 1897.

The recent lectures given by Professor Terrier upon the surgery of the face have been carefully revised by his two assistants, and are now published, forming a small but very satisfactory treatise upon this branch of operative surgery.

The book is divided into three parts. The editorial work of Part I, The Surgery of the Maxillæ, and of Part II, The Surgery of the Lips, of the Cheeks, of the Mouth, and of the Pharynx, has been done in a great measure by Guillemain, while his associate has paid his attention chiefly to the Part III, The Surgery of the Nose, of the Nasal Fossæ, and of the Sinuses.

Thanks to the large number of illustrations inserted in the text, the amount of information which the book contains is surprisingly large for so small a volume. But little space is devoted to abstract discussion. On the other hand, nearly every operation that up to the present time has been devised for the relief of a given condition, and which has given satisfactory results, is described and its advantages and disadvantages noted. For example, in the chapter upon the operative treatment of hare-lip, the methods of Malgaigne, Mirault, Nélaton, Giraldes, Franco, Desault, Genseul, Blandin, Broca, and Dupuytren are all described and illustrated; from this number a surgeon will have but little difficulty in choosing the one which is most applicable in a given case.

Those of the medical profession who operate chiefly for the relief of lesions involving the throat and nose will find in the third portion of the book an equally complete series of operations from which a selection can be made. Resection of the bones of the nose, rhinoplasty, the surgery of the nasal fossæ, and of the upper pharynx, and the various means employed to gain access to the frontal, maxillary, and sphenoidal sinuses, and to the ethmoidal cells are all fully described, and most of the different instruments required in the peculiar technique are shown in the illustrations. So well are the diagrams used that much information can be gained from the book even by one not familiar with the language.

HENRY P. DE FOREST.

UEBER MARION SIMS UND SEINE VERDIENSTE UM DIE CHIRURGIE. VON PROF. DR. R. OLSHAUSEN. Berlin: Verlag von August Hirschwald, 1897.

This brochure embodies an address delivered at the anniversary celebration of the Kaiser Wilhelm's Academy for Military Instruction. The address is a beautiful tribute to a great American surgeon, in which not only the high professional attainments but also the nobility of the character of the man is spoken of. Professor Olshausen calls especial attention to the teachings of Sims concerning abdominal surgery, and credits him with having been the first to place the question of peritoneal drainage upon a rational basis, although he takes occasion to observe that even now the matter of drainage is much overdone.

The speaker called attention to the service which Sims rendered at the battle of Sedan, where, with a corps of American and English surgeons under him, he gave his especial attention to penetrating abdominal wounds in the Mayory Hospital.

A most delightful feature of this address is that a German surgeon has looked beyond the German horizon and seen an *ausländer*, an American, whom he has been willing to make the subject of an address, and, moreover, whom he has spoken of in words warm with eulogy.

JAMES P. WARBASSE.

TRANSACTIONS OF THE AMERICAN ORTHOPÆDIC ASSOCIATION, Vol. IX. Philadelphia: Published by the Association, 1896.

This is a volume containing some thirty odd papers, and the presidential address of Royal Whitman. Although published under the heading of a special department of surgery, all of the papers may be regarded as valuable contributions to general surgery. The work is well edited and well printed, and does credit to the Association whose work it presents.

JAMES P. WARBASSE.

CORRESPONDENCE.

A CASE OF CENTRAL NARCOSIS PARALYSIS.

To the Editor of the ANNALS OF SURGERY:

SIR,—In an article on "Narcosis Paralysis," published in a recent number of the ANNALS OF SURGERY, the statement is made that "central paralyses are so rare as to be of little practical importance." As a central nerve lesion is certainly one of the rarest complications of anæsthesia, the statement, in the abstract, I still believe to be true, but since the article was written, a case has occurred in my practice which has convinced me that in a concrete instance the condition may be of the greatest practical importance.

As medical literature contains records of but few similar cases, the history of the patient referred to is here given in full.

Mrs. F. S., a short, stout, plethoric German woman, fifty-one years old, was first seen in my office March 2, 1897. Her family history was negative. She had been in this country since 1862, had been married fifteen years, but was never pregnant. For ten years she had had increasing shortness of breath on going up stairs, and appeared to have had some intermittent action of the heart on over-exertion. When asleep her mouth was always open and her breathing stertorous and snoring. Her digestion was good. Menstruation began at fifteen and had always been regular. She still menstruated regularly, but for the past five years, during the menstrual period, she had had "spells" during which she would lose consciousness, froth at the mouth, and, from the description given, have a typical epileptiform attack. After recovery the fingers of the left hand would be numb, then tingle for a time, and finally entirely recover.

Four years ago, without any known injury having occurred, she noticed a hard lump in the right breast in the caudo-mesal quadrant. This was not painful, but she consulted a physician, who told her that she had a cancer and advised removal at once. Unfortunately, she saw another physician, who told her the trouble was one of the nerves and that it would ultimately disappear; still later another told her that one of the milk-ducts was stopped up and that the steady growth which she herself had noticed was due to accumulated milk. With such conflicting advice she did nothing till recently when a hard nodule appeared on the skin surface, and this decided her to have further advice.

Physical examination showed a moderate degree of emphysema of the lungs. The heart's action was regular and there were no murmurs. The tumor in the breast was now about four centimetres in diameter and the nodule on the surface two centimetres across. It was red and appeared to be on the verge of ulceration. The mass was but slightly movable over the chest wall. No enlarged glands could be felt. A diagnosis of carcinoma was made, and immediate removal agreed to.

At 11.10 on the following morning ether was administered; she took it well, and there was but little disturbance. Nausea absent; no cyanosis, and nothing occurred during the anæsthesia at all noteworthy. The method of Halstead was employed to remove the tumor, which proved by its gross appearance and later microscopic examination to be a scirrhous carcinoma. It was firmly attached to the pectoral fascia. Both pectoral muscles and the axillary contents were removed. There was but little loss of blood; the operation with closure of the wound took one hour and forty minutes. Ether stopped at 1; two hundred grammes were used. The patient was put to bed; there was but little nausea, and an hour later she was left in charge of a competent nurse.

When seen at 11 o'clock that night she appeared to be still under the influence of ether. She complained of great thirst, her tongue was dry, and she had vomited the small quantity of milk given her. It was noticed by the nurse, with the first signs of returning consciousness, that the patient could not use her left arm or leg. There appeared to be a complete hemiplegia at first. Now she could raise the arm slightly, but could not use the hand. The right pupil was dilated. The tongue protruded to the left. The left facial muscles were paralyzed, and eye remained partially open unless closed by nurse. She could speak with great difficulty. All fluids by the mouth were stopped and a saline solution (one quart) given as an enema. This was well retained.

March 4. More quiet, but still incoherent in speech. Moved toes well and also leg slightly; upper arm could be raised, but forearm muscles were powerless. Still thirsty. Given fluid diet, which she swallowed fairly well.

March 5. Much the same, but paralysis decreasing. Used fingers slightly. Calomel, grain one, in divided doses followed by citrate of magnesia.

March 6. Bowels not moved. Could move foot freely, and also arm, but not her hand. Swallowed better and articulation was clearer. Urine contained a marked trace of albumen.

March 7. Dressed. Wound healed *per primam* along entire line of incision. The gauze drain placed at the dependent part of axilla had become clogged, and there was some retention of wound secretion. Drainage-tube introduced. Her general condition was much improved. She articulated well, and could swallow as well as ever; complete control of leg, and nearly complete of arm. Bowels not yet moved. Two cathartic pills given,—she had always been more or less troubled with constipation.

March 8. When seen this afternoon she had evidently grown worse. Breathing was labored and thick. Bowels not yet moved; glycerin enema; Epsom salts, a teaspoonful every hour, but practically without result. Breathing more stertorous than usual, but no symptoms of lung trouble. Left leg showed renewed loss of power.

March 9. Condition steadily growing worse. Pulse rapid, face flushed. Left hemiplegia complete. Could not swallow. Later on in the day stertorous breathing became more marked, with loss of speech, but she still understood questions and could move head. The extension of the paralysis was now progressive and rapid and at 8 P.M. she died.

The wound was examined twice after first dressing and continued to do well. On the evening of the 8th she had a rectal temperature of 103° F., the highest point reached, and this went down to 100° the following day. An autopsy could not be obtained, so the exact site of the central lesion is not known.

HENRY P. DE FOREST.

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